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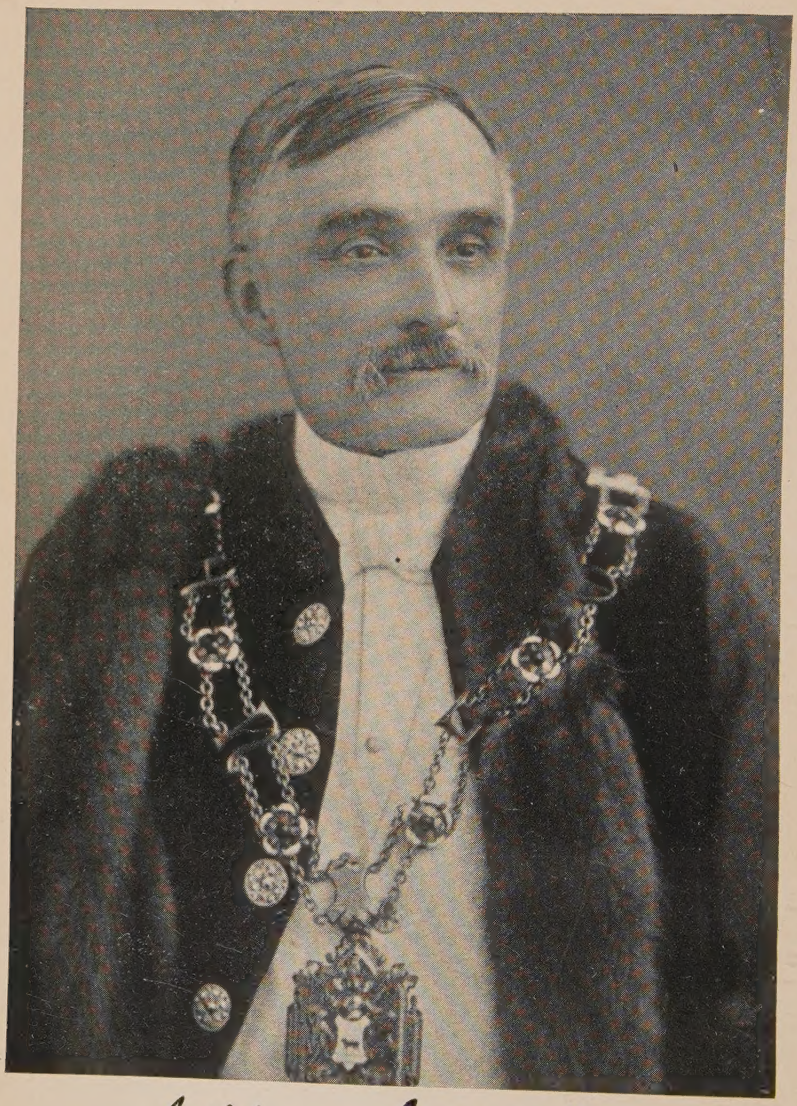

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FROM JULY 1, 1900, TO JUNE 30

1901

WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL CONFERENCE

AT THE

THIRTY-EIGHTH ANNUAL MEETING

HELD IN

DUBLIN

JULY, 1901

LONDON
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OF THE

British Pharmaceutical Conference.

1900-1901.

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(*b*) To assist in stimulating research by asking pharmacists, who have the time, ability, and disposition, to contribute from time to time a paper or useful note to its annual meetings.

(*c*) To endeavour to induce defaulters to continue their membership.

(*d*) To take generally a watchful and sympathetic interest in the affairs of the Conference.

To render these services voluntarily at times convenient to themselves and as opportunity offers.

THE

BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION ESTABLISHED IN 1863 FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH, AND THE PROMOTION OF FRIENDLY INTERCOURSE AND UNION AMONGST PHARMACISTS.

THE most important ways in which a member can aid the objects of the Conference are by suggesting subjects for investigation, working upon subjects suggested by himself or by others, contributing information tending to throw light on questions relating to adulterations and impurities, or collecting and forwarding specimens whose examination would afford similar information. Personal attendance at the yearly gatherings, or the mere payment of the annual subscription, will also greatly strengthen the hands of the executive.

A list of subjects suggested for research is sent to members early in the year. Resulting papers are read at the annual meeting of the members; but new facts that are discovered during an investigation may be at once published by an author at a meeting of a scientific society, or in a scientific journal, or in any other way he may desire; in that case, he is expected to send a short report on the subject to the Conference.

The annual meeting for 1902 will be held at Dundee.

Gentlemen desiring to join the Conference can be nominated at any time on applying to the Secretaries, or any other officer or member. The yearly subscription is payable in advance, on July 1st. The amount, which includes free delivery of the Year-Book, is 7*s.* 6*d.* for members residing within the Postal Union. Further information may be obtained from

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THE YEAR-BOOK OF PHARMACY.

The Conference annually presents to members a volume of about 600 pages, containing the proceedings at the yearly meeting, and an Annual Report on the Progress of Pharmacy, or Year-Book, which includes notices of all pharmaceutical papers, new processes, preparations, and formulæ published throughout the world. The necessary fund for accomplishing this object consists solely of the subscriptions of members. The Executive Committee, therefore, call on every pharmacist—principal, assistant, or pupil—to offer his name for election, and on every member to make an effort to obtain more members. The price of the Year-Book to non-members is ten shillings. The constitution and rules of the Conference, and a convenient form of nomination, will be found at page 249.

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INTRODUCTION.

No event during the past year has attracted more attention from the medical profession and from analysts, and no medical or chemical question for years has been observed and discussed with more interest by the laity, than the outbreak, in the Manchester district, of the epidemic of peripheral neuritis, which has been attributed to the consumption of beer contaminated with arsenic. In consequence, the literature of toxicological chemistry has been enriched by a vast number of modifications of apparatus for applying the chief processes for the detection of this metal, and of manipulative modifications of its tests. One result of the publication of so many communications on the subject has been to emphasise the fact that, at first, unfortunately, in the performance of these processes the factor for the "personal equation" was undesirably large, as shown by the enormously discordant quantitative results obtained by different workers with the same method. An excellent summary of the question from its analytical aspect has been published by *Paul and Cownley*; this has been followed, as the importance of the subject demanded, by the issue by the *Council of the Society of Chemical Industry* of a treatise on the "Detection and Determination of Arsenic," which includes all the important additions to the literature of the subject, all official tests of the various Pharmacopœias, and not least in value, the opinions of experts, as expressed in the discussion of these papers, at the meetings of the Society of Chemical Industry. Among the first to introduce a convenient form of apparatus for the application of *Gutzeit's* test for arsenic was *W. Kirkby*; soon followed, in the same direction, by *F. C. J. Bird* and *C. T. Tyrer*. *Otto Hehner* has described a method for the application of the *Marsh-Berzelius* test, which is applicable either to beer, glucose, malt, or other material. *A. H. Allen* advocates the use of a modification of the *Reinsch* test, and *E. W. T. Jones* a combination of the *Reinsch-Marsh* methods. *E. Dowzard* has contributed a method

for the detection of arsenic in *glucose*, the substance to which the poisonous contamination was finally traced. *J. A. Smith* discusses the influence of *sulphites* on the delicacy of the tests employed, and *Sheridan Delapine* describes a method of manipulation for obtaining *microscopic sublimates* of arsenious acid. A side issue has been raised, first by *Tunnicliffe and Rosenheim*, as to the part played by the trace of *selenium* which is found in some beers, and the latter follows his first communication with a detailed method for its detection. *W. H. Wilcox*, however, does not attribute any of the observed results to the presence of that metalloid. A question yet to be determined is the physiological action of the arsenical impurity, the toxicity of which would appear to greatly exceed that of any pharmaceutical preparations of arsenious acid, and to which the human organism does not appear to acquire a tolerance by prolonged use, such as is the case with arsenic in other forms. In another direction, *T. Lauder Brunton and F. W. Tunnicliffe* have directed attention to the toxic effect, ultimately less serious than that of arsenic, but much more universal, which follows the excessive consumption of immature distilled spirits and fermented beverages. This is attributed to the presence of *furfuraldehyde*. The presence of *methyl alcohol* in beverages made from fermented fruit juices, in some cases to the extent of one or two per cent., is noted by *Jules Woolf*. Grain spirits were, however, found to be normally without a trace of this body.

Inorganic chemistry has been enriched at the close of the month of June, by the discovery of a new element, *Europium*, precise details of which were not, however, published at the end of the month by its discoverer *Demarcay*. It belongs to the rare earths, and is placed between gadolinum and samarium. A method of obtaining pure *bismuth oxide* free from oxy-salts, described by *P. Thibault*, is of considerable importance as affording a means for the preparation of pure organic salts of that metal. *H. Fonzes-Diaçon* has prepared two new *copper selenides*, Cu_2Se and $CuSe$, by heating cuprous or cupric chloride in selenuretted hydrogen. In the same manner he has obtained five *iron selenides*—$FeSe$, $FeSe_2$, Fe_2Se_3, Fe_3Se_4 and Fe_7Se_8. *Cobalt selenides* have also been obtained, four in number—$CoSe_2$, Co_2Se_3, Co_3Se_4 and $CoSe$. New *copper* and *lead sulphides* are described by *F. Bodroux*, obtained by the action of calcium polysulphide solution on the salts of the respective metals at low temperatures. These have the composition Cu_2S_5 and PbS_5 respectively. *G. J. Fowler* obtains *iron nitride* Fe_2N by the action of ammonia on ferrous haloid salts, or

on reduced iron, heated to 414° C. and describes its characters. *Quartz* has been applied to the manufacture of chemico-physical apparatus by *W. A. Shenstone*, who has to a great extent overcome the difficulties attendant on working the substance in the plastic state, by means of laborious and skilful manipulations. The methods are described in detail, and a practical demonstration of their perfection has attracted much attention. *H. Moissan* and *A. Stock* have prepared two *silicon borides*, SiB_3 and SiB_6, by the fusion of the elements in the electric furnace; also *samarium carbide*, SaC_2, by the interaction of carbon and samarium oxide. The former investigator has obtained a new compound of sulphur and ammonia, *sulphammonium*, by the action of liquefied ammonia on sulphur. It probably has the constitution $(NH_3)_2S.2NH_3$ between 0° C. and 20° C., while at —23° C. the formula is $(NH_3)_2S.NH_3$. Pure *sodium peroxide* is described by *G. F. Jaubert* as a yellow body which is not deliquescent. *Tungsten monophosphide*, WP, has been obtained in a crystalline condition by *E. Defacqz*, by fusing together copper phosphide and amorphous tungsten diphosphide. *E. Mathay* has described the method of separation of *tellurium* from the telluriferous alkaline residues obtained as a by-product in the preparation of bismuth, in which 26 kilos. of the metalloid was obtained from 321 tons of bismuth ore. The characters and physical properties of the metal thus recovered are described. *A. Scott* and *W. Arbuckle* have devised an improvement in the method of Stas for the preparation of *iodic acid* both as regards time and yield. The two *mercury iodides* have both been obtained from solution in a crystalline condition by *F. Bodroux* by the interaction of methyl or ethyl iodide on mercurous or mercuric salts.

In inorganic analytical chemistry *K. Cameron* has suggested a method for the alkalimetric determination of *carbonates* in the presence of bicarbonates by means of a standard solution of potassium acid sulphate, which combines with the former but is without action on the latter.

The *alkaline persulphates* are now being considerably prescribed by French physicians, and are therefore worthy of pharmaceutical attention. *M. Moreau* has published two volumetric methods for their determination, both iodometric. The same method is applied by *E. Rupp* to the determination of *hydrogen peroxide*. *C. T. Bennett* publishes a method for the determination of *mercury* in its combinations, by dissolving in nitric acid and reducing the mercuric nitrate thus formed by means of hypophosphorous acid. The

official requirements for the mercury content of *ammoniated mercury* are considered to be too high, and are not attained in commerce. The application of *de Koningh's* reagent (solution of sodium cobaltinitride) as a precipitant in the gravimetric or volumetric determination of *potassium* is described by *R. Adie* and *T. B. Wood*; both methods give results which compare favourably with the platinic chloride method generally followed. *F. Wirthle* has called attention to the occurrence of *tin* in tinned foods, a subject which deserves the attention of analysts in this country. *F. A. Upsher Smith* criticises the official test for thiocyanates in *potassium bromide* and suggests an amended method of treatment. *T. S. Barrie*, employing toluol as an immiscible solvent to remove the iodine liberated by 5 per cent. solution of potassium bichromate and 10 per cent. sulphuric acid, titrates the iodine thus removed in the usual manner. He claims that the method is particularly applicable to *potassium iodide*, or generally for the determination of iodides in the presence of chlorides or bromides.

The same investigator has again directed attention to *calamine*, that at one time much analysed article, and finds it still far from pure; he therefore reiterates the suggestion that it should be prepared by precipitation to ensure uniformity of composition. *R. Dupuoy* directs attention to the occurrence of metallic antimony, or its oxyiodide, as an impurity in *arsenic iodide*. *E. F. Harrison* states that contamination with copper is frequently met with in specimens of *reduced iron*, and in one instance antimony was met with. In *water analysis* many colorimetric methods have been brought forward for the detection of organic contamination. Among the quantitative processes introduced may be mentioned the method of *H. Henriet* for the determination of *nitric nitrogen*, which is based on the interaction between stannous chloride and nitric acid, in which the latter is converted into hydroxylamine hydrochloride. The residual stannous chloride is then determined volumetrically. *Gasselin* employs a volumetric method for the determination of *lime* salts in water; the lime is precipitated with a known quantity of standard oxalic acid solution employing excess; this excess is then titrated by standard permanganate, and the amount of calcium oxalate precipitated thus determined.

In organic chemistry as applied to materia medica, a most interesting series of researches has been continued by *A. Tschirch* and collaborators on the constitution of resins, oleoresins,

and allied substances. Among the substances reported on, are *Uganda Aloes*, *Canada Balsam*, *Copal*, *Larch turpentine*, *Jura turpentine*, *the oleoresins of Pinus sylvestris*, *P. pinaster*, *Strasburg* and *Bordeaux turpentines*. As a result of these researches, the chemistry of these hitherto little understood substances has been greatly elucidated. The investigator, who has made this subject his own, is able to suggest a classification of the resins on the rational ground of their chemical constitution.

In a nearly adjacent portion of the field of research, that of the investigation of the chemistry of the essential oils, considerable additions to our knowledge have been made, some of which will probably bear valuable practical results. The oil of *Acacia farnesiana* is found to contain a violet-scented ketone, probably *β-ionone*. *Bergamot* and *lemon* oils have been found to be abnormally poor in quality from the unfavourable weather prevalent during the last harvest. The former oil has not attained the specific gravity which was previously considered the minimum, consistent with purity. *Bitter almond oil* is still met with, according to *E. J. Parry*, adulterated with nitrobenzene and synthetic benzaldehyde. *Buchu oil* of good quality should contain, according to *Kondalow* and *Batschiew*, 60 per cent. of menthone and 10 per cent. of diosphenol, but the composition will probably be found to differ with the variety of buchu leaves employed.

From *calamus oil*, *H. von Soden* and *W. Rojahn* have isolated a new crystalline body, $C_{15}H_{26}O_2$. *E. Kremers* publishes a method for the determination of *carvone*, based on the formation of carvoxime, which is weighed as such. *Cascarilla* oil has yielded *G. Fendler* a new acid, cascarillic acid, $C_{11}H_{20}O_2$ from its high boiling portion. The *eucalyptus oils* continue to yield some interesting and valuable products. From the oil of *Eucalyptus aggregata*, *H. G. Smith* has isolated the amyl ester of eusdesmic acid; while in the oil of *Eucalyptus macarthuri* no less than sixty per cent. of geranyl acetate and 10 per cent. of free geraniol are said to occur.

E. Charabot has continued his investigation of the physiological processes involved in the elaboration of essential oils in the plant. As with the oil of other species examined, *geranium oil* is found to increase in ester content as the plant matures; the total alcohols increase, but the free alcohols show a slight diminution; the amount of the ketone (menthone) also increases at a later period. *Ginger oil* has given *H. von Soden* and *W. Rojahn* a new light sesquiterpene, zingiberene, $C_{15}H_{24}$. *Jasmin oil* has been further

investigated by *Hesse* and *Mueller*, who have isolated a new ketone —*jasmone*, $C_{11}H_{16}O$. They confirm the presence of indol in the enfleurage prepared oil, which is not present in the oil extracted by solvents. They cannot detect the jasmal of *Verley*. *Kamferia oil* has also yielded *P. van Romburgh* a new constituent, *paramethoxycinnamic acid*. *Lavender oil* contains coumarin as a normal constituent. It is occasionally met with adulterated with resin. *A. Soldaini and E. Berté* publish a series of tests for the *aurantiaceous* oils, including a new modification of the bisulphite absorption method for the determination of citral. The difference in chemical constitution between the the two *lignaloe* oils is confirmed. The Cayenne variety, "bois de rose femelle," contains, according to *E. Theulier*, no methylheptenone, no geraniol and no terpineol, all of which are normal constituents of the Mexican oil. *Schimmel & Co.* have distilled a new oil, that of *Melissa calamintha*, which is described as being very fragrant.

Jeancard and Satie have described some of the rarer *petitgrain* oils, from lemon and mandarin, and note the fact that a marked loss of esters takes place in the process of distillation of petitgrain oil, almost fifty per cent. of the total esters being destroyed in this way, as shown by the ester value of oils prepared by extraction with a volatile solvent, and by distillation. *Nutmeg oil* is the subject of a communication from *M. W. Allen* and *E. T. Brewis*, who show that the normal oil will not respond to the Pharmacopeial tests, and that to obtain the official article, recourse must be had to fractionation.

The volatile oil of *Ocimum basilicum* has been found by *P. van Romburgh* to contain a new terpene, *ocimene*, $C_{10}H_{16}$, which, in some degree, resembles the myrcene of *Power*. *Myrcenol*, the alcohol obtained by the hydration of myrcene, is not identical with linalool, as stated by *Power* and *Kleber*, but according to *P. Barbier*, although it has the constitutional formula attributed by *Tiemann* to licareol (l-linalool) it yields an acetate quite distinct from linalyl acetate, and, on oxidation, an aldehyde which is not citral, the oxime and semicarbazide differing markedly from those of citral. Consequently in the author's opinion, the formula of *Tiemann* for lævo-linalool requires revision. The change undergone by the *oils of orange* in the flower and fruit has been traced a step further by *E. J. Parry*, who has examined "*orange pea*" oil, the product of the immature fruit. As the various vegetative phases progress, the oil is found to decrease in specific gravity and increase in optical activity, the "pea" oil forming the con-

necting link between flower and fruit oil. In this case it is evident that terpenes are formed at the expense of esters. According to *Schimmel*, *sweet orange oil* contains besides terpenes, decyclic aldehyde, dextro-linalool, dextro-terpineol, nonyl alcohol and caprylic acid.

The same authorities find that the methyl ester of methyl-anthranilic acid is a constituent of *mandarin oil*. In *parsley oil*, *C. Bignami* and *G. Testoni* have obtained evidence of the existence in large quantity of a body allied to myristicin, having the formula $C_{11}H_{12}O_3$. Russian *peppermint oil* is reported on by *Lifschitz*, who states that it possesses a very delicate aroma, and shows a higher ester number than Mitcham peppermint. *Rose oil* has been the subject of much investigation, without, unfortunately, the discovery of any definite and reliable test to differentiate between genuine and adulterated otto of rose. *German rose oil*, distilled in Saxony by Schimmel, contains normal nonyl-aldehyde, citral, lævo-linalool, normal phenyl-ethyl alcohol, and lævo-citronellol. It is much richer in stearoptene than Bulgarian otto, and when freed from this odourless constituent, richer in alcohols. A comparative method for the determination of *citronellol* is given. *E. J. Parry* has examined authentic specimens of *Bulgarian rose oil*, derived from *Rosa centifolia* and *R. alba*, as well as from the official source, *R. damascena*. He points out that the prescribed botanical source in the Pharmacopœia is, of itself, sufficient to exclude much Bulgarian rose oil. He finds that the oil of *Rosa alba* is of exceptionally fine quality, and of great fragrance. A specimen of *petal otto*, distilled from rose petals free from calices, is also reported on. *R. von Soden and W. Rojahn* attribute the preponderance of phenyl-ethyl alcohol in rose oil obtained by enfleurage, over that derived from distillation, to the solubility of that alcohol in water. *Thoms* finds the principal constituent of *rue oil* to be *methylnonylketone*, with a little methylheptylketone, while *H. von Soden* and *K. Henle* show that in *Algerian rue oil*, the latter constituent largely predominates, thus explaining the observed fact that the Algerian oil does not solidify at ordinary temperatures. *West Indian sandal oil*, derived from *Amyris balsamifera*, is stated by *H. von Soden and W. Rojahn* to contain two isomeric alcohols, α- and β-amyrol. These are not primary alcohols. On saponification a crystalline substance—amyrolin, $C_{14}H_{12}O_3$—is obtained. *East Indian Sandal oil* has been further investigated by *M. Guerbet*, *H. von Soden* and *F. Mueller*. The two santalols have been further examined. The last named worker has isolated a new hydrocarbon,

santene, from the non-alcoholic constituents of the oil. By oxidising sandal oil with permanganate, *A. Chapman* has obtained santalenic acid in large crystals and has prepared a series of its salts. *M. Kersbaum* has compared French and Spanish *verbena oil*, which he finds to differ very widely in their constituents. The Spanish oil contains a much lower percentage of citral, and a new ketonic body, which is not present in the French variety. A new alcohol, *limonenol*, has been synthetised by *P. Genvresse*, to which the generic formula $C_{10}H_{16}O$ is attributed. It is obtained by the action of nitric peroxide on limonene.

The examination of plants for alkaloidal constituents has been actively carried on, and some important work on the constitution of known alkaloids has been perfected. *J. O. Schlotterbeck* has isolated *protopine* from the roots of *Adlumia chirrosa*, which he considers identical with the socalled fumarine. *H. M. Gordin* has published an exhaustive treatise on the *alkaloidal assay of drugs* in which he gives perfected methods of rapid and accurate determination of the basic active principles of several drugs much used in pharmacy. *H. Laval* has shown that *animal charcoal* possesses a great affinity for certain alkaloids, removing them from solution. *E. Merck* publishes an improved method for the alkaloidal assay of *belladonna extract*, and *F. C. J. Bird* has completed his investigations on the same subject. *K. Greimer* has isolated several poisonous alkaloids from common plants of the N. O. Boraginaceæ; in the case of *Cynoglossum officinale* his observations have received independent confirmation at the hands of *Vouranzos*, who has isolated therefrom two toxic bases. Several poisonous alkaloids have been separated from the seeds of *Echinops* by *Greshoff*. *H. A. D. Jowett* has continued his investigation of the constitution of pilocarpine; various oxidation products and bromo-compounds of isopilocarpine and pilocarpine are described. *Pinner and Kohlhammer*, working on the same subject, describe the formation of a dibasic bromocarpnic acid, which Jowett has been unable to obtain, as well as other oxidation products. From the seeds of *Perganum harmala*, *O. Fischer* has obtained a mixture of alkaloids from which harmine, harmaline and harmalole have been separated; these yield secondary bases on treatment with reagents. *Nux vomica* has been subjected to a number of experiments by *F. C. J. Bird*, who publishes a rapid and convenient method for the assay of the seeds and the galenical preparations thereof; he has also determined the duration of time necessary for the complete precipitation of strychnine ferrocyanide under the conditions of the official tests

and the most suitable amount of material to be taken for analysis. He also finds that the decrepitation of the strychnine residue during drying may be obviated by the addition of a little amyl alcohol. *J. Fohl* describes a method for the determination of *nicotine* in tobacco, while *A. Pictet* and *A. Rotschy* announce the occurrence of three new alkaloids—*Nicotelline*, $C_{10}H_{18}O_2$; *Nicoteine*, $C_{10}H_{12}N_2$; and *Nicotimine*, $C_{10}H_{14}N_2$, in crude commercial tobacco extract.

W. R. Dunstan and H. Brown have found that Egyptian grown *Datura stramonium* is rich in *hyoscyamine* in a pure state, and the same investigators state that Egyptian *Hyoscyamus muticus* is much richer in that alkaloid than the plants grown in India. *U. R. Lamar* advocates a modification of *Squibb's* method for the determination of the alkaloids of *coca leaves*, using kerosene as the solvent. *W. Garsed* and *J. N. Collie* find that *cocaine* forms a very stable di-iodohydriodide, which is insoluble, and base thereon a process for the volumetric determination of the alkaloid, by an indirect iodometric method.

E. Jungfleisch and E. Léger find that the base previously described by them as cinchonifine is identical with *hydrochinchonine*, which is invariably present in considerable quantity in commercial cinchonine sulphate.

H. Pommerehne attributes to *damascenine*, from the seeds of *Nigella sativa*, the formula $C_9H_{11}NO_3$, and states that the base is not saponified by treatment with alkali, but becomes isomerised, being converted into an acid. *J. J. Dobbie, A. Lander* and *P. J. Paliatseas* find that the bases, *corydaline* and *corybulbine* from *Corydalis cava* differ from each other by a CH_2 group, as morphine does from codeine. Corybulbine is easily converted into corydaline.

Chief among the investigations of the non-alkaloidal constituents of drugs must be noted the continued researches of A. Tschirch and his pupils on purgative principles. From the bark of *Rhamnus frangula* he has isolated *rhamno-citrin*, *rhamno-lutin*, *rhamno-chrysin*, and *rhamno-emodin*. The latter is considered to be the active principle. From senna, in conjunction with *F. Hiepe*, the same author has isolated *senna-rhamnetin*, *anthraglucosennin*, *glucosennin*, *senna-emodin*, *senna-iso-emodin*, *senna-rhamnetin* and *senna-nigrin*. The author concludes that an emodin is the chief purgative principle of these, as well as of rhubarb, aloes, and other drugs. *W. A. H. Naylor and C. S. Dyer* have further examined the crystalline principle *oroxylin*, to which the formula $C_{19}H_{14}O_6$ is given. It is found to contain

three hydroxyl groups and a benzene nucleus. A toxic glucoside *Tutin* has been detected by *T. H. Easterfield* and *B. C. Aston* in the leaves of *Coriaria ruscifolia*, *C. thymifolia* and *C. angustissima*.

Tiliadin, a new crystalline body, which is not a glucoside, has been isolated from lime-tree bark by *W. Bracutigan*. The colouring matter of *saffron* is stated by *A. Helger* to be a phytostearyl ester of palmitic and stearic acid. *Nataloin* has been examined by *A. Tschirch* and *J. Klaverness*, who agree with *Léger* as to its formula. They find that it contains five hydroxyl and one methoxyl group, representing its constitutional formula as $C_{15}H_{10}O.(OH)_5.(OCH_3)$. The resin of Natal aloes is the paracoumaric ester of natalresinotannol.

The so-called reaction of *Klunge* for barbaloin is shown by *Léger* not to be given by that body at all but by the accompanying isobarbaloin. From *Nerium odorum*, *R. C. S. Bose* has obtained a new body, *karabin*, in addition to the neriodorin and neriodorein of *H. G. Greenish*. From *gentian root*, *E. Bourquelot* and *H. Herissey* have isolated the crystalline bitter principle *gentiopicrin* as well as a new sugar, *gentianose*, and sucrose. From various species of *Erysimum*, *Schlagdenhauffen and Reeb* have isolated a toxic glucoside *erysimin*, which is noteworthy as being one of the few poisonous principles obtained from the Cruciferæ.

C. O'Sullivan has published a classical investigation on *tragacanth*, which shows that bassorin acts as an acid and yields, when treated with excess of alkali, two acids. The soluble portion of the gum consists of a number of gum acids, similar to the geddic acids of the same author, but differing from them in optical rotation.

From *galls*, *A. Fernbach and H. Pottevin* have isolated a new ferment, *tannase*, which has a powerful hydrolising action on tannin, and many other instances of special *zymases* have been reported, notably that of the etiolated shoots of *Arrhenatherum bulbosum*, which hydrolyses graminin, the oxydase of *Schinus molle*, and others. The tendency of research in this direction is to show that all living tissue has a direct active ferment which will hydrolise some special food material.

In the application of chemical tests to drugs, apart from alkaloidal assay, to determine their purity, no very marked advance has been made. *Schimmels* have shown the fallacy of the *iodoform reaction* as applied to detect the presence of minute traces of alcohol in essential oils. *J. F. Liverseege* confirms his previous statement as to the value of the optical test for the determination of camphor in *camphorated oil*. *E. Dowzard* criticises the official

characters and tests for *castor oil*, and suggests an amended monograph. *J. Humphrey* calls attention to the ambiguous wording of the paragraph on the test for *Peruvian balsam* in the Pharmacopœia.

T. F. Harvey gives the results of experiments on the cause of deterioration of *Spirit of Nitrous Ether*. *C. R. C. Tichborne* states that the characters and tests given in the Pharmacopeia for *linseed oil* are incorrect. *E. White* advocates the inclusion of tests for the fatty acids of the *official soaps* to ensure that they may be obtained from the prescribed source. *H. G. Greenish* has made a minute and exhaustive series of determinations of the ash of *cardamom* seeds, and fixes the limit for purity at 5·54 per cent. *C. Cowley and T. P. Catford*, working on the same lines, report *cobalt* as one of the constituents of the ash. *H. Borntraeger* gives a practical scheme for the testing of commercial *gutta percha*. *D. Hooper* reports favourably on *thansha*, the extract obtained from the bark of *Terminalia oliveri*, as a substitute for cutch in tanning operations, and *W. Garsed* gives the analytical figures for *akee oil*.

In new remedies of real value the past year has not been very fruitful; the number of new so-called synthetic preparations is still great, but in many instances these are little more than proprietary mixtures masquerading under a pseudo-chemical title. The consequence has doubtless been to bring this class of remedies into disrepute.

A considerable amount of valuable work has however been done in the pharmacognosy and therapeutics of crude drugs. *J. Gordon Sharp* has compared the therapeutic activity of *Alstonia constricta* and *Alstonia scholaris* barks, and finds them markedly different. The dose for the tincture official in the Indian and Colonial Addendum of the Pharmacopeia should be, for *Alstonia scholaris* ½ to 1 fluid drachm, but for *Alstonia constricta* only 5 to 20 minims. *H. G. Greenish* has investigated the ash content of a great number of specimens of *colocynth pulp and seeds*, and gives the histological characters which distinguish the powdered seeds when fraudulently mixed with the pulp.

J. C. Umney reviews the official requirements for *Copaiba balsam* and compares these with the tests of other Pharmacopœias, and with the results of the examination of samples now obtainable in commerce. A modification of the characters and tests is advocated; the volatile oil and resin are recommended to be dealt with separately. *A. Russell Bennett* has contributed a valuable paper on the

constituents of commercial *ginger*, showing the difference of the trade varieties in ash, volatile oil, resin and extractive.

E. M. Holmes reviews the botanical sources of *Jaborandi leaves*, as represented by specimens in the Society's Museum. *D. Hooper* reports on two new *kinos*, one derived from *Macaranga roxburghii*, the other from *Myristica gibbosa* and *M. kingii*. *P. Preuss* contributes an interesting account of the method of collection of *Peruvian balsam* as witnessed by him on the spot. *Aweng* confirms the statement of *Tschirch* that the active principles of the various *Rhamni* and *Rhei* are emodins in combination with specific glucosides. Comparing the therapeutic value of *Rhamnus catharticus* and *R. frangula*, *E. B. Squibb* pronounces in favour of the latter.

H. G. Greenish has determined the amount of ash of all the commercial varieties of *senna*, and gives the histological description of the powdered drug. *P. E. F. Perrédes* describes a new admixture of *strophanthus* which is identified as belonging to *S. courmonti, var. kirkii*. *J. Slinger Ward* notes two cases of sophistication of stramonium leaves in which the leaves of *Carthamus helenoides* and of *Xanthium strumarium* were the adulterants. *E. M. Holmes* has detected a *false scammony root*, of which a considerable quantity was imported into this country; the botanical source of the substitute has not yet been determined. *Saffron* has been found to be adulterated with *red sandalwood*, by *Beythien*, weighted with *potassium borotartrate*, by *Daels*, and by mixtures of *magnesium sulphate*, *potassium nitrate* and *potassium borate*, by *Fresenius* and *Gruenhut*.

A *false rhatany root* has been detected by *P. H. Marsden* in the Liverpool Drug Market, and a specimen of spurious *quinine bark* has been examined by *E. W. Pollard*. *Cinnamon bark* has been stated to be mixed with guava bark. *E. H. Holmes* and *H. G. Greenish* describe a *spurious senna* which appeared on the London Drug Market, and which is referred to *Cassia montana*. A serious substitution of the root of *Phytolacca* for that of *Belladonna* is also reported on by the same authorities.

Pharmacists have shown considerable activity in the elaboration of their art during the past twelve months.

E. B. Squibb reports favourably on dilute acetic acid as a percolation menstruum for the official (U. S. P.) *Rhamnus* barks. *Edmund White* has called attention to a marked and undesirable divergence of certain commercial specimens of *Belladonna extracts* from typical preparations made strictly according to the official

directions. *G. F. Merson* attributes the deficiency of solid residue of commercial *compound tincture of benzoin* to the use of low grade storax, and suggests manipulative improvements in the preparation of the tincture. The same author, and also *F. McDiarmid*, publish figures giving the average specific gravity and extractive content of *liquid extract of cascara*. *W. Lyon* has published an exhaustive article on the pharmacy of *chloretone*, and *F. Bascombe* unfavourably criticizes the official *concentrated liquors*. *D. Gilmour* would render the preparation of *glycerin of boric acid* more simple, and of better consistence for application to mucous surfaces. *H. Whippel Gadd* strongly controverts the statements of *Glode Guyer* as to the instability of the official *ipecacuanha* preparations. *F. A. Lieker*, in a suggestive note, advocates the use of *solid paraffin* to remove the fat from *nux vomica extract*. *W. A. H. Naylor* has contributed a valuable practical paper on the preparation of the official and unofficial *oleates*. *G. F. Merson* suggests a slight modification in the final volume of *syrup of rhubarb* as tending to afford a permanent product.

H. G. Greenish and *F. A. Upsher Smith* have conducted a long and very thorough series of determinations of the *solubilities* of official salts. *G. F. Merson* advocates the employment of a valoid fluid extract of squill for the preparation of *syrup of squill*, and *J. F. Brown* would slightly modify the process for the *oxymel of squill*, bringing up the final specific gravity to a definite figure. *D. Gilmour* discusses the best method of storing *spirit of nitrous ether*, and *W. B. Cowie* reverts to the subject of the general inaccuracy of the dosage of *suppositories*. *W. Lyon* gives a modification of the formula for *Easton's syrup* and also for the B. P. C. formula for *compound syrup of the hypophosphites*.

F. W. Fletcher publishes a valuable table of specific gravities and percentage of alcohol and of extractive of the *official tinctures*, and *W. Lyon* criticizes the Pharmacopeial directions for the preparation of *ointment of mercuric nitrate*.

The arrangement of the formulæ in the present volume has been somewhat modified. Those preparations which, although in constant use in the pharmacy, and forming an important adjunct to every day business requirements, cannot be regarded as strictly pharmaceutical, have been classed apart.

The arrangement of the subject matter has been made alphabetical. In reference, this will probably commend itself as saving time and labour.

In conclusion, the editor, on succeeding at short notice to one

who, for many years, has proved himself a master of the art of compilation and abstracting, solicits the indulgence of members of the Conference for such defects as may be apparent in the present volume. To take the place of the former editor, was, in itself to invite invidious comparison. The time available for the preparation of the volume having been about one fourth of the normal period, has also rendered the work more arduous. Although no effort has been spared to maintain the high standard of the previous volumes, the editor is conscious that the result may suffer by comparison with the work of his lamented predecessor.

CHEMISTRY.

YEAR-BOOK OF PHARMACY.

PART I.

CHEMISTRY.

Acacia Farnesiana, Volatile Oil of. (*Schimmel's Report, May* 1901, 18.) In addition to methyl salicylate, which has previously been found to be present in the oil extracted by alcohol from "cassie pomade," a violet-scented ketone has now been isolated, by fractional distillation under reduced pressure, which further investigation will probably show to be β-ionone. In the lower fractions of the oil several alcohols are also present; among them, benzyl-alcohol has been isolated.

Adlumia Cirrhosa, Occurrence of Protopine in. J. O. Schlotterbeck (*Amer. Drugg.*, xxxvii. 374) has isolated protopine from the Alleghany vine, or climbing fumitory, *Adlumia chirrisa.* It occurs in the dried root to the extent of 1 per cent. and is present in less quantity in the herb. It was extracted from the powdered drug by chloroform, after treatment with ammonia and drying; from the chloroformic extract the alkaloid was removed by acetic acid, precipitated by ammonia, and shaken out with ether, from which it readily crystallised; it was purified by recrystallisation from ether, until the resulting pure alkaloid had the m.p. 207° C. With platinic chloride it formed a double salt crystallising in dark yellow spheroids. H_2SO_4 gave a deep red colour reaction with the base passing to deep violet. Concentrated HNO_3 gave no colour in the cold, but developed a red tint on warming. Erdmann's reagent gave an immediate violet blue colour. The alkaloid agrees in all particulars with protopine isolated by the author from *Bocconia cordata.* He calls attention to the probable identity of the so-

called fumarine, derived from various plants of the family *Fumaria*, with protopine. He has found it to agree in all physical characters with protopine. Since fumarine was isolated and named long before the detection of protopine in opium by Hesse, it is suggested that the prior name of "fumarine" should be substituted for protopine if the two bases be proved to be identical.

Akee Oil. W. Garsed. (*Pharm. Journ.* [4], xi. 691.) The oil is a yellowish nondrying butterlike fat, with a peculiar odour, and a somewhat unpleasant taste. It had the following characters: sp. gr. 0·857 at 99°–100° C., compared with water at 15·5° C. m. p. 25° to 35° C. Congealing point 20° C. Hehner number 93. Saponification (total acid number) 94·6. Reichert number 0·9. Hubl number 49·1. Free acid number 20·1. The fatty acids consist of oleic and possibly a mixture of stearic and palmitic acids, or a new homologue of these; about 50 per cent. of the oil consists of liquid glycerides, with 40 per cent. of solid glycerides and 10 per cent. of free acid.

Albumin test for Phenol and Creosote. J. L. Mayer (*Merck's Report*, through *Pharm. Journ.* [4], xii. 429) disposes of the ambiguous statements found in current literature with reference to the behaviour of phenol and creosote towards albumin. He finds that both cause coagulation, so that it is an error to consider the test as distinctive. The author finds, however, that the behaviour of the two is somewhat different. Creosote, when mixed with albumin solution, causes almost immediate coagulation, forming a mass so gelatinous that it can be cut with a knife. Phenol, however, gives a liquid with white flocculi, which remains mobile for some days before finally gelatinising.

Alcohol, Determination of, in Perfumes and Toilet Articles. (*Pharm. Centr.*, xlii. 124.) When the presence of volatile oils obscures the direct spirit indication, as in the case of perfumes, the determination of the alcoholic strength may be conducted as follows. 50 Gm. of the sample is diluted with water (50 Gm.) in a separator, and mixed with 50 Gm. of petroleum ether. After thorough agitation the mixture is allowed to separate for twelve hours; the watery layer is then drawn off, weighed, and its sp. g. determined by means of the Westphal balance. From this the amount of alcohol present in the original substance may be deduced. If resins or extractive matter be present, the 50

Gm. of the article is diluted with an equal weight of water, and at least 80 Gm. distilled off before treatment with petroleum ether. When much glycerin is present, as in the case of brilliantines, and similar preparations, twice the weight of water must be added, and 100 Gm. distilled off from the 150 Gm. thus obtained, the distillate being then extracted with petroleum ether as before, previous to weighing for the alcohol determination.

Alcohol in Essential Oils,—Iodoform Reaction for. (*Schimmel's Report*, *Oct.* 1900.) It is found that lemon oil and even American turpentine oil, which are absolutely free from ethylic alcohol, may yet give a distinct iodoform reaction, when iodine and caustic potash are added to the concentrated aqueous distillate. This reaction is probably due to the presence of minute traces of aldehydes or ketones such as acetaldehyde and acetone. It would seem therefore that the production of iodoform reaction is not absolutely trustworthy as indicating the presence of alcohol in essential oils.

Alkaloidal Assay of Crude Drugs. H. M. Gordin. (*Amer. Journ. Pharm.*, lxxiii. 159, 211.) Two general alternative methods given below have been found to give good results as compared with a standard method for the alkaloid-containing drugs.

Method A.—Ten Gm. of the drug in No. 60 powder are put into a Dunstan and Short apparatus, and extracted with alcohol (95 per cent.) for about three to four hours on an asbestos plate. Most of the alcohol is then distilled off on a water-bath, and when the extract is reduced to about 10 c.c., it is cooled and diluted with water containing about 1–2 per cent. of sulphuric acid. The liquid is then poured into a 50 c.c. or a 100 c.c. measuring flask, washing the vessel in which the boiling took place, and filling up the flask to the mark with acidulated water. The liquid is now shaken with a little talcum, filtered, and in 25 c.c. of the filtrate the alkaloids estimated by passing through immiscible solvents, using either ammonia or sodium hydrate for the liberation of alkaloids and either ether alone or a mixture of ether and chloroform in the right proportions to take up the alkaloids. In the case of hydrastis, a little potassium iodide is added before filling the flask up in order to remove berberine. The alkali used to liberate the alkaloid is generally ammonia, except in the case of cinchona, where it was found that ammonia gives rise to an emulsion, whereas sodium hydrate works very well. If a fixed

alkali be used, it is necessary to shake up the ethereal solution of the alkaloid with calcined magnesia, and filter in order to remove the last traces of alkali. After distilling off the ethereal liquid the alkaloids are estimated by the general alkalimetric method.

Method B.—This consists in digesting the drug in very fine powder with ten times its amount of modified Prollius' fluid, thus composed: ether (sp. gr. 0·720) 250 c.c.; chloroform 80 c.c.; absolute alcohol 25 c.c.; strong solution of ammonia (28%) 10 c.c., putting the mixture into a mechanical shaker for four hours, or shaking frequently during twelve hours, drawing off an aliquot part, and shaking out with acid water. The alkaloids are then set free by ammonia, or NaOH, and shaken out with an immiscible solvent. The final estimation is carried out in the same way as in method A. The method B is practically the same as that given by Lyons. It differs from Keller's method in so far that no water is added for the purpose of causing the drug to ball together, and that the liquids are taken by volume, not by weight. This addition of water is certainly a source of indefinite error. Water takes up some ether, and together with it some alkaloid. Besides, water itself dissolves the alkaloids to a greater or less extent. Codeine, for example, is soluble in eighty parts water, atropine in 135 parts. But even an alkaloid which is very difficultly soluble both in water and ether is taken up to a considerable extent by water when an ether-chloroform solution of the base is shaken with that fluid.

Coca Leaves.—Standard method.—Ten Gm. in No. 60 powder were moistened in a small mortar with 5 c.c. of diluted alcohol, then placed in a small percolator, washing the mortar out repeatedly with fresh menstruum and pouring the washings on the top of the drug. Following the general rules of percolation, i.e., macerating forty-eight hours, etc., the percolation was continued very slowly till about 200 c.c. of percolate were obtained. The first 10 c.c. were received into a 50 c.c. measuring flask and set aside; the balance was concentrated in vacuo, first at about 45° C., then at ordinary temperature, till reduced to about 25 c.c. This was added to the reserved portion, and the whole, after washing the vessel in which the concentration took place with acidulated (2 per cent.) water, was made up with acid water to 50 c.c.

The acid liquid was then filtered (using a little talcum), and 25 c.c. (= 5 Gm. drug) shaken out four times with ether and

ammonia, using 30 c.c. ether each time. After distilling off the ether completely, a few drops chloroform and then 20 c.c. of N/40 acid were added, and the chloroform removed by blowing air into the flask. The estimation was then carried out by the general alkalimetric method, using Mayer's reagent as precipitant.

It was found that 5 Gm. of the drug consumed 6·6 c.c. N/40 acid = 1 per cent. ether soluble alkaloids, calculated as cocaine.

Method A gave 0·988 and 1·00 per cent., and being easily carried out should be adopted for the assay of coca leaves.

Hydrastis canadensis. Standard method.—10 Gm. of hydrastis in No. 60 powder was treated as described under "Coca Leaves," the extraction menstruum being however 6 volumes of alcohol (94 per cent.) three volumes of water and 1 volume of glycerin. The percolate was concentrated *in vacuo* to about 50 c.c. mixed with the reserved portion previously collected in a 100 c.c. flask, and after washing the vessel in which the concentration took place, diluted with water containing 2 per cent. of sulphuric acid and 5 per cent. of potassium iodide. After shaking a few minutes the liquid was filtered and 20 c.c. of the filtrate (= 2 Gm. of the drug) was made alkaline with ammonia and shaken out three times with a mixture of 3 volumes of ether and 1 volume of chloroform, using 30 c.c. each time. The assay was then completed as in the case of coca. The "standard" method gave 3·47 per cent. of hydrastine, and method "A" a precisely identical figure.

Nux vomica.—Standard Method.—This drug is very difficult to exhaust completely. After trying several neutral, as well as acid menstrua, the following method was found to work well. Though in this method acid is used, it can nevertheless be used as a standard, since the strychnos alkaloids are not easily affected by dilute acids.

Ten Gm. of drug in No. 60 powder were moistened in a screw top jar with 5 c.c. of a menstruum containing 75 per cent. alcohol and 2 per cent. phosphoric acid. The jar was then covered and set aside for forty-eight hours. The drug was then put in a small percolator, the jar washed out several times with the same menstruum, the washings poured on top of the drug and more of the same menstruum added till the liquid reached the lower orifice (about 23 c.c. menstruum was used). The percolator was then closed and set aside for twelve hours. The percolation was then continued very slowly with a menstruum containing 75 per cent. alcohol and about one-quarter of 1 per cent. phosphoric acid till

about 200 c.c. were obtained. The first 10 c.c. were received into a 100 c.c. measuring flask and the rest concentrated, *in vacuo* first at about 45° C., and then at ordinary temperature till the percolate was reduced to about 60 c.c. The concentrated extract was then added to the reserved portion, the vessel in which the concentration took place washed with water, and the whole made up to 100 c.c. This was shaken about one half hour with talcum powder, filtered, and from 20 c.c. of the filtrate (= 2 Gm. of drug) after making alkaline with ammonia, the alkaloids were shaken out three times with a mixture of 3 volumes of ether, and 1 volume of chloroform, using 30 c.c. each time. After distilling off the solvent the alkaloids were taken up with a little chloroform, 20 c.c. of N/40 acid added, and the last trace of chloroform removed by a current of air aid, the final determination made alkalimetrically using N/40 alkali for residual titration and Mayer's reagent as the precipitant. The result made 3·27 per cent. of total alkaloids, taking the mean factor for strychnine and brucine. Method A was found to give very low results, but method B gave good results, employing 4 Gm. of the drug in very fine (100) powder, and 50 c.c. of the modified Prollius' fluid, shaking for 4 hours in a mechanical agitator drawing off 25 c.c. (= 2 Gm. of the drug) and shaking out with acid water. The acid solution was made alkaline with ammonia, the alkaloids shaken out with three successive portions each of 30 c.c. of a mixture of ether 1 volume, chloroform 2 volumes, the solvent distilled off and the residue titrated alkalimetrically. The results obtained were 3·14 and 3·09 per cent. of total alkaloid, a little lower than those of the standard method.

Cinchona Bark.—After several trials the method given below was found to give good results.

The assay was made with a view of estimating the total alkaloids as well as the ether soluble alkaloids. As alkalimetric factor of ether soluble alkaloids, the mean diacid factor of quinine and cinchonidine was taken, which for N/40 acid is 0·00385.

The Standard Method.—Ten Gm. of cinchona bark in No. 60 powder was moistened with 5 c.c. of a mixture containing 50 per cent. alcohol and 2 per cent. hydrochloric acid, and the extraction finished in the same way as that of nux vomica, using hydrochloric instead of phosphoric acid. After concentration *in vacuo*, the liquid was made up to 100 c.c., filtered, and 25 c.c. of the filtrate (2·5 Gm. drug), after making strongly alkaline with sodium hydrate, was shaken out three times with a mixture

of three parts ether and one part chloroform, using 30 c.c. each time. The ether-chloroform was shaken up with a little calcined magnesia, filtered into a tared flask, the vessel and filter well washed with ether-chloroform, and the liquid completely removed by distillation. After drying the flask at 130° C. for one hour, it was cooled in desiccator and weighed. This gave the total alkaloids in 2·5 Gm. of drug.

To the flask containing the total alkaloids, 10 c.c. absolute ether and a few grammes coarse clean quartz was added, and the flask shaken in a horizontal plane till all the adhering matter was rubbed off from the walls by the quartz; the liquid was then filtered through a small dry filter into another flask, the first flask, the quartz and the filter washed three times with absolute ether, using 5 c.c. each time, and the ether completely distilled off. The residue of the ether soluble alkaloids was now taken up with a little chloroform and 40 c.c. N/40 sulphuric acid, the chloroform removed by a current of air and the alkaloids estimated alkalimetrically, using N/40 alkali for residual titration, and a 2 per cent. solution of iodine in potassium iodide as precipitant. Using this method as a standard, several other more expedient methods were tried. None gave as good results when compared with the standard as method B. Two assays were then made by method B, using 10 Gm. of the same bark reduced to a very fine powder for each assay, digesting with 100 c.c. modified Prollius' fluid, drawing off 25 c.c. (= 2·5 Gm. of drug) and shaking out with acid water. The acid solution was then shaken out with light ether chloroform and the assay finished exactly as in the standard method. The results were as follows. Standard method total alkaloids 6·81 per cent. Ether soluble alkaloids 3·57. Method B, total alkaloids 6·73 and 6·76 per cent.; ether soluble alkaloids 3·6 and 3·58 per cent.

As A and B give identical results, B should be adopted as being the more convenient.

Ipecacuanha. This is another drug which is extremely difficult of exhaustion. The following method was found to give the best results:

Ten Gm. of drug in No. 60 powder were shaken two days in a shaker with 100 c.c. of a menstruum containing 50 per cent. alcohol and 2 per cent. acetic acid; the whole was then thrown into a percolator, returning the first portion until the percolate came out clear, and the percolation continued with 50 per cent. alcohol, containing about one quarter of 1 per cent. of

acetic acid, till exactly 600 c.c. were obtained. 150 c.c. of the percolate (=2·5 Gm.) was made alkaline with ammonia and shaken out four times with a mixture of four parts ether and one chloroform, using 200 c.c. of this mixture each time. The ether-chloroform was distilled off completely, the residue taken up with about 10 c.c. of acidulated (1 per cent.) water, and the liquid filtered into a small separator, washing the vessel from which the ethereal liquid was distilled and the filter repeatedly with small quantities of acidulated water. The alkaloid was now shaken out with heavy ether-chloroform (1 ether, 2 chloroform) and ammonia, and the ether-chloroform completely distilled off. The residue was taken up with a little chloroform and 20 c.c. N/40 sulphuric acid, and after the removal of the chloroform by a current of air, the assay was finished alkalimetrically, using Mayer's reagent as precipitant. The dregs in the percolator were tested for alkaloid as usual, but none was found.

Using this as a standard, the drug was assayed by many different methods, but none gave as good results as those obtained by the standard method. Those obtained by method B, after reducing the drug to a No. 100 powder, came nearest.

Method Used.	N/40 Acid Consumed by 2·5 Grammes.	Percentage of Alkaloid.
Standard . . .	11·5 c.c.	2·92
A	9·6 c.c.	2·43
B	10·2 c.c.	2·59

It will be noticed that 0·00635 was taken as the factor of emetine for each cubic centimetre of N/40 acid. This is based upon the assumption that the formula of emetine is $C_{30}H_{40}N_2O_5$ (Kunz Krause, *Archiv der Pharm.*, ccxxv. 461; ccxxxii. 466) and that the salts of emetine correspond to the formula $C_{30}H_{40}N_2O_5 2\overline{A}$ where $\overline{A}$ is one molecule of a monobasic acid. As this formula is not yet accepted all round, the above factor will possibly have to be slightly changed.

Conium seeds or leaves. The following modification of the method of Cripps gives good results.

Put 20 Gm. of finely powdered conium into a 300 c.c. glass-stoppered bottle, pour in 200 c.c. of a previously prepared mixture of one volume of chloroform and three volumes of ether, shake about five minutes, add 10 c.c. liquor potassæ, shake frequently

during four hours, and set aside over night. Pipette off 100 c.c. of the clear liquid into a 300 c.c. flask, add 10 c.c. of a 2 per cent. solution of oxalic acid in alcohol and mix well. Distil off the liquid completely, removing the last traces by blowing air into the flask while keeping it on the water-bath. Let cool, add 10 c.c. absolute alcohol, warm gently and cool again. Filter the alcoholic solution into a wide beaker, washing the flask, and filter three times with 5 c.c. each time of absolute alcohol. Evaporate the alcohol almost completely from a warm water-bath, add 10 c.c. water and pour into a 25 c.c. measuring flask, cool, and fill up to the mark with water. Add about 2 Gm. talcum, shake well and filter through a small dry filter. Pipette off 12·5 c.c. (=5 Gm. drug) into a 100 c.c. separator, add 25 c.c. petroleum ether (boiling below 60° C. and leaving no residue on evaporation) and 5 c.c. of a 10 per cent. solution of KOH. Shake well and set aside until the liquid separates into two layers. Draw off lower layer into a 50 c.c. separator, add to it 20 c.c. petroleum ether, and shake. After separation into two layers, draw off lower layer into a beaker and pour contents of second separator into the first one. Return the aqueous liquid to the smaller separator and shake it again with 20 c.c. petroleum ether. Draw off aqueous layer and pour the petroleum ether from the second into the first separator. Test a few drops of the aqueous liquid, after acidulating with Wagner's reagent. If no reaction, reject it. If a reaction is obtained, shake the liquid again with 20 c.c. petroleum ether in the second separator. Now add about 0·5 Gm. MgO to the petroleum ether, and shake well about 15 minutes. Filter into a 300 c.c. flask, washing filter and separator repeatedly with petroleum ether, and keeping funnel covered with a watch-glass. Add 50 c.c. of a perfectly clear saturated solution of HC1 gas in absolute ether, mix well and distil off the solvent from a warm water-bath completely, removing last traces by means of a current of dry air. Now add to the flask 25 or 30 c.c. N/40 $AgNO_3$ and then 5 c.c. 10 per cent. HNO_3. Put on water bath, and when the supernatant liquid becomes clear, cool the flask, transfer its contents into 100 c.c. measuring flask, and make up the whole to 100 c.c. Filter, add to 50 c.c. of the filtrate 5 c.c. test solution of ferric alum, and titrate the excess of silver nitrate with N/40 potassium sulphocyanate in the usual way. The number of cubic centimetres of N/40 $AgNO_3$ consumed by the 5 Gm. drug multiplied by 0·0635 gives the per cent. of conine in the drug.

Assay of fluid extract of cinchona. Put 10 c.c. of the fluid extract into a 50 c.c. measuring flask and fill up to the mark with a 2 per cent. solution of sulphuric acid. Add about 1 or 2 Gm. powdered talcum, shake vigorously a minute or two and filter through a dry filter. By means of a pipette or a burette transfer 25 c.c. (= 5 c.c. extract) into a separating funnel having a capacity of about 125 to 150 c.c. Add into the separator 40 c.c. of a mixture of three volumes of ether and one volume of chloroform, then add a considerable excess of a 10 per cent. solution of potassium hydrate, and shake well a few minutes. Set aside until the mixture has separated into two layers. There is generally no emulsion at all. Should there be one, the addition of a little more potassium hydrate will generally destroy it. Draw off the lower layer into a second smaller separating funnel, add to it about 20 c.c. of the same ether-chloroform mixture and shake again a few minutes. After separation into two layers, draw off the lower layer into a beaker and carefully pour the ethereal liquid from the smaller into the larger separator. Return the aqueous liquid to the smaller separator and shake out once more with about 20 c.c. of above ether-chloroform mixture. When the liquids have separated into two layers, draw off the lower layer, which can now be rejected, and carefully pour again the ethereal liquid from the second into the first larger separator. Now add into the separator 1 Gm. of calcined magnesia, and shake until the ethereal liquid, upon a few minutes' standing, separates out crystal clear. If it does not become perfectly clear, add a little more magnesia and shake. Now filter through a dry filter into a light tared flask, washing the separator and the filter repeatedly with ether, and distil off the ethereal solvent completely, taking care to prevent loss by spurting. Dry the flask for two hours at 130° C., and after cooling in desiccator, weigh. The weight multiplied by twenty gives the per cent. of total alkaloids in the extract.

For the estimation of ether soluble alkaloids, add into the flask a few grammes of clean coarse quartz and then 10 c.c. of stronger ether, then give the flask a circular motion in a horizontal plane till all adhering matter is detached from the sides of the flask. Now filter the ethereal solution into a small flask, washing the quartz and the filter three or four times with stronger ether, using 5 c.c. each time. Add to the ethereal solution 20 to 25 c.c. of N/10 H_2SO_4, mix carefully by gentle rotation, and distil off the ether completely, removing the last traces by a current of air. Cool and transfer the acid solution to a 200 c.c. measuring

flask, washing the distilling flask repeatedly with water. Add to the measuring flask an excess of Wagner's reagent, make the liquid up to 200 c.c. and shake till supernatant liquid is perfectly clear, but dark red. Filter off 100 c.c., decolourise with enough sodium thiosulphate solution and titrate excess of acid, with N/100 potassium hydrate, using phenolphthalein as indicator. The number of cubic centimetres of N/10 acid consumed by the 5 c.c. of the extract multiplied by 0·308 gives the percentage of ether soluble alkaloids in the extract.

Alkaloidal Solutions, Action of Charcoal on. H. Laval. (*Bull. de Pharm. du Sud-Est*, v. 195.) Experiments conducted on solutions of alkaloidal salts with pure animal charcoal, with the ordinary commercial form, with bone ash, and with precipitated tricalcic phosphate, show they all have more or less activity in removing the salts of organic bases from aqueous or alcoholic solution. Pure animal charcoal is most active in this respect. The length of time of contact does not influence the result, but the strength of the solution has a marked influence, much more alkaloid being removed from weaker than from stronger solutions. The nature of the solvent affects the absorption; aqueous solutions giving up more alkaloid to the charcoal than alcoholic. The different alkaloids vary in their affinity for charcoal. Thus 75 per cent. of the alkaloid is removed by 10 Gm. of pure animal charcoal from a solution of 1 Gm. of strychnine in 100 c.c of water; with morphine 73 per cent. of the dissolved alkaloid is eliminated; with quinine 75 per cent.; with atropine, cinchonine, and cocaine, 68 to 69 per cent.

Aloes Natal, The Aloins of. E. Léger. (*Bull. Soc. Chim.*, xxiii. 787.) The aloin of Natal aloes is separated by repeated recrystallisation from boiling methylic alcohol, into two distinct crystalline bodies, one of which, being less soluble, separates out in hard yellow crusts. This is homo-nataloin, $C_{15}H_{16}O_7$; it differs from the more soluble nataloin, $C_{16}H_{18}O_7$, which subsequently separates from the mother liquor in pale yellow, short lamellæ, in containing a CH_2 group less. The two nataloins give a fine green colour when treated with sulphuric acid and potassium bichromate or manganese dioxide. When dissolved in caustic soda and treated with a particle of ammonium persulphate they develop a fine violet colour.

Aloes, some Colour Reactions for. E. Hirschsohn (*Pharm. Centr.*, xlii. 63) gives the following as a general test to which all the commercial varieties of aloes respond. To 10 c.c. of a 1:1,000 solution of aloes add one drop of a 1:10 solution of cupric sulphate and 1 drop of hydrogen peroxide. On heating, a deep raspberry red colour will be produced. In the case of Cape and hepatic aloes the presence of alcohol hinders the reaction; inorganic acids and alkalies prevent the formation of the colour, but acetic acid is without influence on it. *Curaçoa, Barbados, Zanzibar and Natal aloes* give a rose tint after boiling; if a drop of solution of potassium ferricyanide, 1 : 15, be substituted for the hydrogen peroxide, a brownish or raspberry red colour is first produced; on boiling a precipitate is formed, the filtrate from which shows the rose tint in the cases named.

Curaçoa and Barbados aloes give a raspberry red colour, even in the cold, which is more pronounced on warming, or if the ferricyanide in the test be replaced by a 1:15 solution of potassium thiocyanate or sodium nitro-prusside.

Natal aloes gives a red colour on boiling with solution of borax. *Curaçoa and Barbados aloes* give a more or less red tint when boiled with copper sulphate alone, or with hydrogen peroxide alone, and less so with the other reagents. Old aqueous solution of aloes, and tinctures which have been exposed to sunlight, do not react well.

Aloes, Uganda. A. Tschirch and J. Klaverness. (*Archiv. der Pharm.*, ccxxxix. 241.) Uganda aloes only contains a small percentage, 5 to 6 per cent., of ugandaloin, $C_{16}H_{16}O_7$, which is identical with capaloin. It is best extracted by chloroform from a strong methyl-alcohol solution, by Léger's method. It is obtained in the form of yellow, doubly refractive prisms with pyramids, which melt at 138–139° C.; the crystals deposited from alcoholic solutions contain one molecule of H_2O. After removing the resin from a solution in acetone by means of ether, and then concentrating by distillation and allowing the residue to stand for some months, all the ugandaloin is converted into emodin, which is deposited in the form of red crystals melting at 224° C. The resin of Uganda aloes is the paracumaric ester of ugandaresinotannol. On distilling Uganda aloes, dissolved in weak potassium carbonate solution, and shaking out the aqueous distillate with ether, a small amount of a yellow volatile oil having an odour between rose and balm, is obtained, which solidifies on cooling.

Arsenic, Detection and Chemical Identification of. B. H. Paul and A. J. Cownley. (*Pharm. Journ.* [4], xii. 136.) A valuable and critical article on the tests for arsenic at present in use, and the methods for applying them, which should be consulted in the original.

Arsenic, Apparatus for Testing for. C. T. Tyrer. (*Chem. and Drugg.*, lviii. 389 and 493.) The author describes two forms of modifications of apparatus—the first for use for the Marsh-Gutzeit test, the second for Marsh's test only. Drawings accompany each of the notes.

Arsenic, Detection of, by Gutzeit's test; Apparatus for. W. Kirkby. (*Pharm. Journ.* [4], xii. 80.) The author has devised a small apparatus which is figured in the original communication, for the detection of arsenic in beer and other substances. A small Ehrlenmeyer flask is fitted with a glass stopper which carries three potash bulbs, which are surmounted by two spherical bulbs. The potash bulbs are half filled with a five per cent. solution of lead acetate. The exit tube terminates in a small thistle funnel which is covered with a filter paper cap bearing a drop of dried mercuric chloride solution.

Arsenic, Detection of, by Gutzeit's test. F. C. J. Bird. (*Analyst*, xxvi. 181.) The author has devised a special apparatus for the applications of Gutzeit's test for the detection of arsenic, a figure of which accompanies the original paper. It is claimed that by the use of this the usual detrimental points of the method are overcome. It consists of a flask bearing a side tube funnel fitted with a stopcock for the gradual introduction of the acid. In the neck of the flask is fitted a glass sphere, surrounded by a cup containing water, which acts as a cooler on the evolved gases. These are transmitted through a perforated tube into an upper chamber shaped like an inverted funnel, through 10 per cent. lead acetate solution; they thence pass over small disc-like caps of mercuric chloride paper. The diameter of these is 5 mm., on which $\frac{1}{100}$ Mgm. of A_2O_3 in the original solution produces a distinct orange colour in about ten minutes. The quantity of pure hydrochloric acid used is to be in all cases half the volume of the test liquid, and should be delivered in ten minutes, after which the contents of the flask receive five minutes' further boiling. Absence of any means of identifying the stain obtained by this test has been held

to be a fatal objection, but the author has worked out what he believes to be a thoroughly satisfactory method. The stained disc or discs are detached from the tips of the tubes by moistening with a wet glass rod, and placed in a watch-glass. About 1 c.c. of pure hydrochloric acid is added, the whole warmed, and the acid poured off. This method of removing the mercury salt is repeated a second time, the paper by this time being of a brick-red colour. Half a c.c. of bromated hydrochloric acid is next added to dissolve the arsenical deposit, which leaves the paper colourless. The resulting liquid is placed in a minute test-tube and identified as arsenic by adding an equal volume of stannous-chloride solution. With as small a quantity as $\frac{1}{100}$ Mgm. As_4O_6 a pink-brown colour immediately appears. The test is especially adapted for quickly finding out whether a substance contains a quantity of arsenic exceeding certain limits, and rapidly gives an approximate quantitative determination according to the depth of colour of the stannous-chloride test.

Arsenic, Detection of, in beer. Otto Hehner (*Journ. Soc. Chem. Ind.*, xx. 194.), in the course of a discussion on the detection of arsenic in beer, gave the following details of modification of the Marsh-Berzelius method, which he describes as being sufficiently delicate and very definite in its results. The hydrogen requisite is obtained from zinc and hydrochloric acid. It is important not only that the zinc should be arsenic free, but also that it should be sensitive to the presence of arsenic under the conditions of the test. The fact pointed out by Dyer some years back, that certain forms of zinc do not yield a good arsenical mirror is confirmed, the author stating that, in his experience, this is the case with the metal cast in the form of rods. When these are melted and granulated the mirror is obtained with certainty. The hydrochloric acid employed should first be subjected to vigorous boiling to drive off every trace of arsenic. About 10 Gm. of this zinc is then introduced into a 250 c.c. flask, fitted with a two-hole rubber cork. Through one hole passes a tap funnel, through the other, the exit tube, connected with a tube holding a roll of dry lead acetate paper, then a plug of cotton wool, then granulated calcium chloride, about 3 inches in length, and then another plug of wool. To this is attached the hard glass reducing tube, quill size, drawn out in the middle to a thickness corresponding to a standard wire gauze No. 13 (0·092 inch) at the place where the arsenical mirror is to make its appearance. Five c.c. of water is now run into the flask,

followed by 10 c.c. of the pure HCl. The issuing hydrogen is then ignited, a Bunsen flame applied to the reducing tube, and the time noted. The Bunsen is removed in fifteen minutes, when no arsenical mirror should be apparent. Having thus assured the absence of arsenical impurity in the reagents and apparatus, 10 c.c. of beer is slowly dropped in, care being taken to introduce no air, and the Bunsen flame reapplied to the reducing tube. If frothing occurs a little strong alcohol may be used, but if possible this should be avoided. The test should be continued for fifteen minutes. The mirror-bearing tube is now disconnected, hydrogen removed by suction, and the narrow parts fused up on both sides of the mirror. On gently drawing this closed tube through a flame until the mirror disappears, the arsenic therein is oxidised by the contained air, and, on cooling, glistening crystals of As_2O_3 will be obtained, which are evident to the naked eye with even so little as one or two thousandths of a milligramme. Selenium and tellurium did not, in his opinion, interfere with the production of the mirror. For quantitative determination, a series of standard mirrors should be prepared by this method, with arsenical solutions of known strength which should not, at the maximum, contain more than 0·01 Mgm. These standard mirrors are fused off, mounted on white card, and kept in the dark, for comparison with those obtained in the course of the test with various materials. With sulphuric acid, a preliminary test with 10 Gm. diluted with water should be made. If the mirror be too strong, a fresh experiment with a less quantity should be performed. With glucose and sugar, 10 Gm. is a convenient quantity to work with. In the case of malt, 10 Gm. should be washed with dilute HCl at first cold, then warmed, three or four times repeated.

Arsenic, detection and determination of, in Beer. W. Kirkby. (*Chem. and Drugg.*, lvii. 968.) The beer is first acidified, then concentrated or evaporated to dryness; redissolved and boiled with a little sulphurous acid to reduce any arsenates, and whole of the SO_2 driven off by boiling. 9 c.c. of prepared beer (reduced) is diluted with distilled water to 15 c.c., and finally made up to 20 c.c. with pure arsenic-free hydrochloric acid (sp. gr. 1·16). This mixture is equally divided between three test-tubes of equal length and diameter. Another 6 c.c. of prepared beer, in this case not reduced with sulphurous acid, is diluted with water to 10 c.c., and made up with hydrochloric acid to 13·3 c.c., and divided between two test-tubes. Plugs of cotton-wool are prepared for loosely stopping

the mouths of the tubes, and four discs of pure white filter-paper of close texture are each moistened with one drop, from the same small glass rod, of a solution of mercuric chloride (1 in 20). In addition, one paper disc is moistened with one drop of solution of lead subacetate. The mercuric papers are used dry, but the lead-paper in the moist condition. When everything is prepared, into each test-tube is placed a piece of arsenic-free zinc rod 15 mm. long and 5 mm. in diameter, the cotton-wool plugs are inserted and two mercuric papers and the lead-paper are placed as caps on the first three test-tubes, and two mercuric papers are placed on the second two test-tubes. When the rate of evolution is sluggish in any individual tube it may be accelerated by very gentle warmth. In the absence of arsenic and an excessive quantity of sulphur compounds, the mercuric papers remain unstained, but in the majority of cases a brown stain is found on the lead-paper. It is found that arsenious acid in the proportion of 0·01 Gm. per gal. will produce a faint yellow stain on the mercuric papers in one hour. One hour is therefore fixed as a suitable time-limit for the process, beyond which there is no need to go, except when testing the zinc and reagents—then three or four hours is not too long a time.

In order to obtain an approximate value of the amount of arsenic present, standard tests with weighed quantities of arsenious acid should be made in the same way, taking care to maintain uniform conditions. These must be carried out with an arsenic-free beer; otherwise, if water be used, an error of as much as 50 per cent. may arise; the evolution of the gas in the beer being scarcely more than one-half the rate it is in water. With each set of experiments for the day it is desirable to put on a new set of standards, as the colours are to a certain extent affected by light. The standards used are 0·05 Mgm. of arsenious acid (As_4O_6), 0·04 Mgm., 0·03 Mgm., 0·02 Mgm., 0·01 Mgm., and 0·005 Mgm. In addition to the standards, control tests of reagents made up with water and beer are also used.

The chief and undoubted value of this test is it indicates the presence of one part of arsenic in a million parts of fluid.

Arsenic, Detection of. A. H. Allen (*Chem. News*, lxxxii. 305), after commenting on the diverse statements as to the value of different tests for the detection of arsenic in beer, states that he finds the Reinsch test, applied in the following manner, to give the most satisfactory results. The hydrochloric acid employed is puri-

fied by distilling off about one-tenth, this fraction containing the minute trace of arsenic originally present. As a rule, 100 c.c. of the beer is taken for analysis, and as a preliminary treatment to eliminate sulphites, hydrochloric acid and a little bromine-water are added, and the liquid boiled for a few minutes. To obviate the difficulty caused by the fact that arsenic acid only responds to Reinsch's test after prolonged boiling and in presence of much acid, a little solution of cuprous chloride in hydrochloric acid is next added, which reduces the arsenic to the arsenous condition. On now introducing about one square centimetre of copper-foil, and boiling, any arsenic is promptly deposited on the copper. The boiling is continued for thirty minutes, any water lost by evaporation being replaced. If the copper has undergone darkening it is dried in the water-oven, cut into strips, and heated in a narrow tube, when a characteristic deposit of arsenious oxide, in the form of microscopic octahedra or tetrahedra, will be obtained if the deposit on the copper was due to arsenic. Unless these crystals can be identified the author is not satisfied that arsenic is present. In doubtful cases, a better definition of the crystals can be obtained by filling the tube with water, which acts only very slowly on crystalline arsenious oxide, and is preferable to alcohol.

This process has the advantage that the arsenic is actually seen and identified as such. Several such deposits can be united, and the arsenic again deposited on copper or subjected to Marsh's test.

For the quantitative determination of arsenic the same authority (*J. S. C. I.*, xx. 197) thus modifies the above process.

One litre or 500 c.c. of the beer, according to the strength of the qualitative indication of arsenic, is evaporated down to about 200 c.c. in a porcelain basin, about 20 c.c. bromine-water and 20 c.c. hydrochloric acid added, and the excess of bromine boiled off, the volume of the liquid being kept at about 200 c.c. A few drops of a freshly prepared solution of cuprous chloride in hydrochloric acid, and three or four pieces of pure copper foil are then added, and the boiling continued for half an hour. The pieces of copper are removed and replaced by fresh ones till finally no darkening takes place. They are then treated in a beaker with hydrochloric acid and crystals of potassium chlorate, taking care to have excess of the latter, till the arsenical coating is removed. The solution is warmed till free from the oxides of chlorine, and transferred to a distilling flask. In more recent experiments a good alternative, and in some respects, preferable method, practised by John Clark and E. W. T. Jones, has been used. This is to cover

the pieces of copper with water in a beaker, add about 10 c.c. of 5 per cent. caustic soda and ten drops of solution of hydrogen peroxide, and allow to stand, in the cold, till the arsenical coating is dissolved. A few drops of the cuprous chloride solution and about 15 c.c. fuming hydrochloric acid are added and the liquid distilled into water till the residue in the flask measures about 15 c.c. The distillation is repeated with 20 c.c. fuming hydrochloric acid, the distillate rendered alkaline with ammonia, and then slightly acidified with hydrochloric acid, keeping it cool by immersion in water. It is then finally neutralised with sodium bicarbonate, a slight excess of sodium bicarbonate added, and the liquid titrated with N/200 iodine solution (using starch as an indicator), 1 c.c. of which represents 0·0002475 Gm. As_4O_6, or 0·00025 Gm. *nearly*.

A blank determination should be made on the reagents employed, the amount of iodine solution required therein being deducted. The hydrochloric acid, copper, cuprous chloride, caustic soda, and hydrogen peroxide are all liable to contain more or less arsenic.

Arsenic in Beer. E. W. Jones. (*Chem. News*, lxxxiii. 25).

Qualitative Test. 250 c.c. of the beer are evaporated in a porcelain dish over a low Fletcher burner to about 100 c.c., then 25 c.c. of pure strong hydrochloric acid are added, and into the still boiling liquid is put a piece of fine copper gauze (this is preferable to foil) about 1 inch by $\frac{1}{4}$ inch, and the boiling continued for a quarter of an hour; if no darkening occurs by this time certainly less than $\frac{1}{40}$ grain per gallon of arsenic is present. If the gauze is suspiciously darkened, wash with hot distilled water, then with alcohol and dry. Roll up into a small size, and introduce into a small glass tube about three inches long, and heat the gauze with a very small flame whilst holding the tube in a horizontal position; examine any sublimate under the microscope, using $\frac{1}{5}$ inch objective. The tubing found very convenient is of elliptical section. It lies conveniently on the stage of the microscope, held on to the usual glass slips by two thin indiarubber bands; such pieces of tube are prepared by drawing out to furnish a shoulder for the piece of gauze, and also that the sublimate may be concentrated in the narrower part. Unmistakable octahedral or tetrahedral crystals of arsenious oxide are obtained without the least difficulty by the above procedure when $\frac{1}{20}$ grain per gallon is present.

For glucose, syrups, jams, etc., 50 Gm. are used, then made up to 100 c.c. at once with hot distilled water, then proceeding in the same way.

To prepare the copper gauze, heat a strip about an inch wide to

redness in a Bunsen burner, and then remove the black oxide with nitric acid, well wash, and dry; from these beautifully bright strips pieces are cut off about a ¼ inch wide for the qualitative test, and about 3½ inches long for the rolls used for the quantitative tests.

Quantitative Test. 250 c.c. (or more) of the beer is evaporated as above in a porcelain dish to about 100 c.c., and 25 c.c. of pure strong hydrochloric acid added, then a piece of the pure bright copper gauze, 1 inch × 3½ inches, in the shape of a loose roll, is put in, and the liquid is kept just on the boil with occasional stirring for say an hour, addition of hot distilled water being made from time to time to prevent the bulk getting too small by evaporation; considerable concentration is advantageous before the bulk is brought back with distilled water. The roll of gauze is now removed and washed with hot distilled water, the first washings being returned to the dish, and then another roll is put in, and the boiling continued.

The blackened and thoroughly washed roll is now put into a small beaker, ¾ inch diameter and 1½ inches high, containing 5 c.c. N/NaHO diluted to just cover the roll, and then 3 or 4 drops of a 10 vol. solution, hydrogen peroxide solution added; by moving the coil up and down this solution is mixed, and on standing in the cold the gauze is gradually denuded of its black coating, and, on acquiring its original colour, is removed and washed into another large beaker, these washings being reserved.

The second roll of gauze after half-an-hour's boiling in the acid beer solution is examined; if dark, is removed, washed, and treated as the first; then the first cleaned roll is introduced again, and so on, till no further deposit shows; generally the third roll shows that all the arsenic has been removed. Each roll is treated as the first, a drop or two more hydrogen peroxide being added, if required, to expedite the removal of the arsenical coating.

The alkaline solution of arsenate and the washings are united and heated on the hot plate for an hour or so; then the copper precipitates, and can be filtered off. 7 c.c. of N/H_2SO_4 are added to the clear filtrate, and then a little pure sulphurous acid solution, till the solution smells of SO_2; the solution is now boiled and concentrated till every trace of this is expelled, and to the solution, whilst hot, is added its own bulk, say 50 c.c., of saturated H_2S water; then H_2S passed through the still warm solution for a time; then it is removed to a warm place and left uncovered all

night; on the following morning the As_2S_3 has collected and can be filtered off through a very small filter, and washed with water till the washings are quite free from saline matter; the As_2S_3 is now dissolved off the filter with the least possible amount of hot, very dilute ammonia water, this solution being evaporated to dryness on the hot plate in a small flat capsule (very small Petri dish-covers 1½ inches to 2 inches diam.); when cool, two or three drops of hot distilled water are added, and drop by drop, very dilute HCl (one drop of the concentrated acid to 10 to 15 c.c. water), till the faintest acidity to litmus (to decompose any ammonium sulphide); evaporate again to dryness, add 2 or 3 c.c. of H_2S water, and evaporate again to dryness; now rinse the residue with a few c.c. of distilled water, and pour off; this is easily done without detaching the sulphide; dry, boil up with CS_2 to remove S, pour off, rinse with strong alcohol, again with water, and heat on plate till quite dry, put under the desiccator till dead cold, then remove to balance with a pair of cold forceps and weigh to the tenth of a Mgm.

Now treat the residue in the capsule with hot ammonia water; this immediately dissolves the As_2S_3, and leaves attached to the dish any trace of copper sulphide; put the solution from the dish and the rinsings into a beaker, and reserve; dry the capsule again on hot plate, and with same precautions, when cold, weigh again; the difference being As_2S_3 found.

One or two experiments should be made with pure beer, fulfilling all the conditions to see if anything is obtained from the reagents used.

To a non-arsenical beer, As_4O_6 was added at the rate of 0·1 grain per gallon, and by the procedure described 0·0896, say 0·09 grain found.

As a check, the dissolved As_2S_3 obtained was re-precipitated, and compared with that from a solution of known strength, viz., where 1 c.c. contains 0·00018 Gm. of As_4O_6, and in 250 c.c. of beer would equal 0·05 ($\frac{1}{20}$) of a grain per gallon.

It will be observed that the actual arsenic obtained from the beer is kept and can be easily corroborated again if desired.

Arsenic, detection of, in Glucose. E. Dowzard. (*Chem. and Drugg.*, lvii. 921.) A flat-bottomed flask (capacity about 130 c.c.) is employed, with a neck about 3½ inches long and ½ inch in diameter. A mixture of 30 c.c. of water, 5 c.c. of hydrochloric acid, and 0·5 drop of a 5 per cent. solution of platinic chloride is introduced. A piece of filter-paper, 12 inches long by ¾ inch broad, is soaked in a 25 per cent. solution of lead acetate, allowed to drain for a few

minutes, then doubled and rolled. A circle of filter-paper, about $\frac{3}{8}$ inch in diameter, is also soaked in the lead-acetate solution and drained. A rod of pure zinc, about $1\frac{1}{2}$ inch long and $\frac{3}{16}$ inch in diameter is placed in the flask, and the neck plugged with a small tuft of cotton wool. The roll of damp lead-acetate paper is now gently placed on the cotton wool, and covered with the circle of lead-paper. Before applying the mercuric-chloride paper, see that the lead-paper is from $\frac{1}{2}$ to $\frac{3}{4}$ inch below the mouth of the flask. The mercuric-chloride is taken off after thirty minutes, and examined: there should not be the slightest coloration. Fifteen grammes of glucose or invert sugar is dissolved in a mixture of 20 c.c. distilled water, 7 c.c. hydrochloric acid, and 0·5 drop of a 5 per cent. solution of platinic chloride. The procedure is then exactly the same as in the blank experiment. The roll of lead-paper is rarely darkened beyond half its length, but, if the whole should be darkened, the test must be repeated, using a roll 1 inch or more in length. If the top portion of the roll has not been affected, it may be safely assumed that all the H_2S has been absorbed. The roll should be so arranged that the gas will come in contact with as large a surface as possible. A faint but quite perceptible yellow spot is produced by 0·00005 Gm. of arsenious acid. Working on 15 Gm. of sample, this test will detect 1 part of arsenious acid in 300,000. If a more stringent test is required, 30 Gm. may be used (it will, of course, be necessary to increase the amount of water and acid in proportion). In this case about 1 part of arsenious acid in 600,000 parts can be detected. An approximate estimate of the amount present can be made by varying the amount of glucose or invert sugar until a spot is produced which is equal in intensity to that produced by 0·00005 Gm. ($\frac{1}{20}$ Mgm.) of arsenious acid, under the same conditions. The mercuric-chloride paper must be dried before use, and should always be examined in full daylight—never by gas or electric light. The cotton-wool plug should be rather tight. As a precautionary measure a piece of filter-paper about two inches square should be soaked in the lead-acetate solution, drained, divided into two or three pieces, and packed on top of the roll. In estimating the amount of arsenic present the standard test must be made with the same weight of glucose free from arsenic, because the glucose retards the evolution of arseniuretted hydrogen; $\frac{1}{20}$ Mgm. of arsenious acid will give a much deeper colour without the glucose than with it. The arsenious acid should be in the form of sodium arsenite.

Arsenic, detection of, in the presence of Sulphites. J. A. Smith (*Chem. News*, lxxxiii. 3.) When sulphuretted hydrogen and arseniuretted hydrogen are heated together a mutual reaction occurs; the products so obtained are sulphide of arsenic, sulphur, and free hydrogen. This takes place when the gases are passed slowly through a tube heated to redness, as in Marsh's test for arsenic; it is also deposited from the flame when the mixed gases are burnt, and a piece of cold porcelain is brought into it. The above reaction therefore forms a convenient method for the detection of arsenic in the presence of compounds of sulphur that give off sulphuretted hydrogen when treated with zinc and acid, not only in inorganic solutions, but in extracts similar to beer, without previous treatment. The experiment is conducted in Marsh's apparatus, and in the same way, the only difference being in the results obtained in the heated tube, or on cold porcelain, as above stated. The following precautions, however, are necessary to obtain all the arsenic as sulphide, in the heated tube. To add the solution under examination slowly and in small quantities of about 1 to 2 c.c. at a time to the acid and zinc, in the generating flask, and to keep the heated tube at red heat for about 1 inch in the centre, otherwise some loss may take place. When cold the deposit is washed with a little carbon bisulphide to remove the free sulphur, and afterwards with a little sodium, potassium, or ammonium hydrate, to dissolve out the sulphide of arsenic, and the tube washed with a few drops of water, two or three times, adding the washings to the solution containing the sulphide of arsenic; neutralise with hydrochloric acid, and if the quantity of precipitate is large it can be filtered off and tested by the usual methods, but if the solution is only slightly coloured yellow it must be evaporated and a few drops of strong nitric acid added and again evaporated to dryness on a water-bath, the residue taken up with a few drops of hot water, and tested by Marsh's method in the usual way. By this, 15 parts of arsenic in 1,000,000 were detected in the presence of a large quantity of bisulphite in 5 c.c. of beer without previous treatment. When the amount of sulphuretted hydrogen evolved is too small to effect the precipitation of all the arsenic, the sulphide is first precipitated nearest the heated part, and after the yellow sulphide a metallic deposit of arsenic, or if the gas is burnt at the end of the tube—which, of course, must not be heated—and a piece of cold porcelain is brought into the flame, there will be a yellow deposit of sulphur and sulphide of arsenic with a metallic

ring round the edge of it; this can easily be tested after the removal of the sulphur and sulphide of arsenic. The above has also been applied to antimony, which undergoes the same mutual decomposition under the same conditions; its detection and separation from arsenic can easily be carried out, as the antimony sulphide is deposited nearer the flame than that of arsenic, and sometimes a distinct line separates the two sulphides. The antimony sulphide can easily be removed by means of dry hydrochloric acid gas after the removal of the free sulphur, and the remaining sulphide of arsenic treated as above, or the separation can be effected by any of the well known methods.

Arsenious Iodide. R. Dupuoy. (*Bull. de Pharm. de Bordeaux.* Through *Pharm. Journ.* [4], xii. 1.) Arsenious iodide, as met with on the Continent, is far from pure, leaving a residue insoluble in water, which may be either the yellow oxyiodide of antimony, SbOI, derived from impure arsenium containing antimony; or a blackish mixture of the same substance with metallic arsenium, or merely antimony. Some specimens also contain an excess of free iodine: these last yield a clear brown solution with water, the colour sometimes disappearing after a short time.

Arsenious Oxide, Method of Preparing Micro-Sublimates of. Sheridan Delapine (*Brit. Med. Journ.*, 2089, 83) adopts the following method for obtaining sublimates from the Reinsch deposit for examination under the microscope.

For this purpose a small cone of thin pure copper foil which measures $\frac{5}{8}$ inch in diameter and $\frac{1}{2}$ inch in height is employed. An iron plate $\frac{1}{8}$ inch thick and 4 inches in diameter, with a central perforation $\frac{5}{8}$ inch in diameter, is used to support the cone, the apex of which projects under the plate. The open end of the cone is provided with a rim which rests on the upper surface of the iron plate. The open basis of the cone is closed with a cover glass $\frac{7}{8}$ inch in diameter.

To test the nature of the deposit on a piece of copper the cone is first heated to redness. When it is cold, the piece of copper to be tested is placed quite at the apex of the cone—if it be large, it should be divided into small square or triangular pieces not more than $\frac{1}{8}$ inch long; the opening of the cone is then closed with the perfectly clean cover glass.

The apex of the cone is then heated to dull redness by means of a small Bunsen flame, the cover glass is watched, and as soon as a distinct sublimate has formed the flame is removed, and the cover glass is taken with a pair of forceps and examined microscopically.

By this method it is easy to obtain a large number of small but very clear crystals of arsenious acid from 50 c.cm. of beer to which 0·00005 Gm. (= 0·00075 grain) of arsenious acid have been added. Narrow tubes are easier to use than the cone when the quantity of arsenic is less than $\frac{1}{20}$ Mgm., but examination under a higher power of the microscope is more difficult. The cover-glass method allows of the use of an oil immersion lens for the detection of quantities under $\frac{1}{1000000}$ Gm. With a little practice it gives good results which are specially useful for qualitative estimations.

Atlas Cedar Oil. (*Schimmel's Report*, May 1901, 58.) The thick pale yellow oil with a balsamic odour, derived from the wood of *Cedrus atlantica*, has not been previously examined. It had the sp. gr. 0·9157; optical rotation at 20° C. + 48° 16′; refraction index 1·51487; solubility in alcohol 90 per cent. 1 : 3 to 4, becoming cloudy on further addition of the solvent. After acetylisation the saponification number was 40·6, equivalent to 16·6 per cent. of an alcohol having the formula $C_{15}H_{26}O$. It has been successfully used in hospital practice in Algeria, as a substitute for sandal oil in the treatment of gonorrhoea.

Barbaloin, Klunge's Reaction for. E. Léger. (*Comptes rend.*, cxxxi. 55). The author finds that the colour reaction of Klunge, the production of a violet red colour on the addition of solution of cupric sulphate and sodium chloride to an aqueous solution of "barbaloin" which was regarded by the first-named as characteristic of that body, is not due to barbaloin at all, but to the accompanying isobarbaloin. He employes the method of Klunge to remove isobarbaloin from barbaloin, heating the mixture of aloins with cupric sulphate and sodium chloride, and separating the crystals which separate on cooling. These crystals are pure barbaloin, and no longer react with Klunge's reagent.

Belladonna, Extract of; Alkaloidal assay of. E. Merck. (*Merck's Report*, viii. 1900, 15). The author considers the use of chloroform as the immiscible extraction solvent to be objectionable on the grounds that it tends to form inseparable emulsions, and that it requires the employment of too high a temperature for the final drying of the alkaloidal residue. The following process is suggested as giving more reliable results. Four Gm. of the extract is dissolved in 6 c.c. of water and washed into a graduated bottle with 10 c.c. more water. 100 c.c. of ether is then added, the mixture shaken and treated with 10 c.c. of a 1 in 3 solution

of sodium bicarbonate, the whole being well shaken for 5 minutes.

It is then allowed to stand for about 20 minutes, the vessel being well stoppered; the ethereal layer is then filtered through a dry filter 9 or 10 c.cm. in diameter, the filter being covered. If an inseparable emulsion forms, a few Gm. of powdered tragacanth should be added, which after standing for 15 minutes will bring about the aggregation of the emulsified portion, and allow the ethereal liquid to be poured off. Previous to titrating this ethereal solution with very dilute standards, blank experiments should be conducted with the shaking flasks to be employed, to ensure that no error may arise from the presence of soluble alkali in the glass. Every flask employed should be subjected to a blank test. 25 c.c. of ether should be placed in it with 5 drops of iodeosine solution and 10 c.c. of N/100 HCl solution. After agitation this should require 10 c.c. of N/100 alkali to restore the characteristic pink colour. If less be required, the experiment should be repeated; if this again requires less than 10 c.c. of the alkali, the flask should be rejected.

Having proved the flask to be free from soluble alkali, 50 to 60 c.c. of water is introduced, 5 drops of iodeosine, 20 c.c. of ether. The mixture is then shaken, and just enough N/100 HCl solution added to render the aqueous layer colourless. To this neutral solution 25 c.c. of the filtered ethereal alkaloidal extract, accurately measured, is added, and the whole titrated with N/100 HCl until the aqueous layer becomes colourless.

The number of c.c. of N/100 HCl employed × 0·289 gives the percentage of alkaloid in the extract.

A modification of the same process is suggested for the assay of extract of nux vomica, the official method for the valuation of that preparation being adversely criticised.

Belladonna, Methods for the Assay of Galenical Preparations of. F. C. J. Bird. (*Pharm. Journ.* [4] xi. 195). In continuation of the work already published (*Year Book*, 1900, 117), the author gives details for the alkaloidal assay of *Suppositoria Belladonnæ*, *Belladonnæ folia*, *Extractum Belladonnæ viride*, *B. P.*, and *Extractum Belladonnæ foliæ alcoholicum B.P.C.* For the modification of the processes adapted to each of these preparations, the original communication should be consulted.

Bergamot Oil; last year's Product. (*Schimmel's Report*, *May* 1901, 27). The bergamot oils of last year's harvest, have a

very low sp. gr., rarely exceeding 0·880 with a correspondingly low percentage of linalyl acetate, the average of which may be taken as 34 to 35 per cent.; it therefore compares unfavourably with the product of the preceding crop.

Blood, Differentiation of Human from Animal. (*Répertoire* [3], xiii. 213.) Bordet has shown that when an animal, for example, a rabbit, is injected, with the defibrinated blood of another species, for instance, an ox, the serum of the blood of the rabbit acquires the property of agglutinating and dissolving the red corpuscles of bullock's blood. Wasserman and Schuetze have applied this property to the differentiation of human blood from that of animals.

They inject defibrinated human blood into a guinea-pig or rabbit, 10 c.c. being employed once daily for 5 days. On bleeding the animal on the sixth day, its blood serum will be found to be active on human blood, but not on the blood of animals. A blood stain to be examined is treated with artificial serum. To 3 or 4 c.c. of the solution thus obtained in a test tube, half a c.c. of the prepared rabbit blood serum is added. In another tube a similar quantity of the same solution is treated with a like quantity of normal rabbit blood serum, from an animal which has received no injection of human blood. In a third tube a similar mixture is made with the prepared serum and a dilute solution of pig's or sheep's blood. If at the expiration of an hour the first tube shows at first a turbidity and finally a precipitate, the spot examined is certainly that of human blood.

Ogier and Herscher report that having experimented on the same lines they are able to entirely confirm the results of Wassermann and Schuetze, and regard the method as most valuable for forensic purposes.

Bismuth, Hydrated Oxide of. P. Thibault. (*Journ. Pharm. Chim.* [6], xii. 559.) By precipitating bismuth salts, in the presence of free alkali, the author has succeeded in obtaining pure hydrated bismuth oxide, free from oxysalts, which is of considerable importance as affording a starting point for the preparation of the organic salts of bismuth, which now find wide application in medicine, but which have been hitherto invariably impure from the presence of oxysalts of the mineral acids. He intimately mixes 20 Gm. of crystalline bismuth nitrate with 30 Gm. of glycerine sp.gr. 1·264, then gradually adds 100 Gm. of water with constant agitation. When solution is complete, the liquid is slowly poured

with constant stirring, into an excess of solution of potash: the precipitate at first formed is redissolved, when the excess of alkali is cautiously neutralized with dilute sulphuric acid, until the reaction is neutral or only faintly alkaline, excess of acid being scrupulously avoided. The gelatinous hydrate thus obtained is washed free from sulphate by decantation, collected and dried at ordinary temperatures over H_2SO_4. It then has the composition $Bi_2O_3 \cdot H_2O$.

Bismuth Subnitrate, Commercial. F. A. Upsher Smith. (*Pharm. Journ.* [4], xi. 692.) As a result of a very complete examination of commercial specimens of British make it is concluded that bismuth subnitrate as prepared by English makers at the present day is uniform in composition as regards Bi_2O_3, varying slightly in acidity and in the moisture it contains.

English samples contain less Bi_2O_3 than some American samples examined by Curtman and Kebler. They are more basic and slightly more acid than the B.P. formula demands. For purposes of calculation a formula corresponding to 80 per cent. of oxide must be taken, and not the B.P. formula. It is undesirable to publish a formula for the salt, unless a detailed method of preparing it be inserted. The determination of oxide by ignition might replace the sulphide determination. A method might with advantage be inserted for determining the N_2O_5.

It is suggested that the Pharmacopœial monograph should be modified to read:—

"Bismuthi subnitras, bismuth oxynitrate. Synonym, subnitrate of bismuth.

"Bismuth oxynitrate, prepared by the interaction of bismuth nitrate and water, containing not less than 80 per cent. Bi_2O_3, nor less than 17·5, nor more than 19·5 per cent. N_2O_5.

"*Characters and tests.*—A heavy white inodorous powder, consisting of minute crystals, with an acid reaction on *litmus*. It should answer to the general characters and tests enumerated under 'Bismuth Oxycarbonate.' It should afford only the slightest reactions with the tests for carbonates. It should yield the reactions characteristic of nitrates. If 1 Gm. be just dissolved in *nitric acid*, and the liquid mixed with 5 c.c. of an aqueous solution containing 2 Gm. of *citric acid* and sufficient *solution of ammonia* to give decided alkalinity, neither precipitate nor opalescence should be produced by boiling the mixture while still faintly alkaline (absence of calcium phosphate). Each gramme should yield, on ignition at a red heat, with the evolution of

reddish-brown fumes, a residue weighing not less than 0·79 nor more than 0·81 Gm. (corresponding to 79 to 81 per cent. of bismuth oxide). 2 Gm. mixed with 5 c.c. of water, 10 c.c. *volumetric normal potassium hydroxide solution* added, and heated on a water-bath with occasional stirring during half an hour, and afterwards filtered, and the filter washed, should require not more than 34·75 c.c., nor less than 27·3 c.c. *volumetric decinormal hydrochloric acid solution* for neutralization, using *phenol-phthalein* as the indicator (corresponding to 17·5 to 19·5 per cent. N_2O_5). Heated at 120° C. the salt loses from 2 to 3 per cent. of its weight. Dose, 5 to 20 grains."

Bitter Almonds, Essential Oil of. E. J. Parry. (*Chem. and Drugg.*, lviii. 588.) During the last few months a large number of samples of oil of bitter almonds have been examined, which have been offered on the market, at full prices, as genuine oil. Quite a number of these were adulterated to a very large extent with a very highly rectified nitrobenzene (with more or less nitrotoluene). This sophistication is, of course, easy of detection, but it is worth drawing attention to on account of the enormous difference in the price of the two products. The adulterated oils had sp. grs. varying from 1·143 to 1·187, and yielded a large fraction on distillation, at from 195° to 215° C. In addition to this form of adulteration several samples were evidently mixed with synthetic benzaldehyde. This is, in most cases, revealed by the presence of small quantities of chlorine, which are retained by the artificial aldehyde during the process of manufacture.

Bitter Almond Oil, Determination of Prussic Acid in. (*Zeits. Analyt. Chim.* through *Meyer Bros. Drugg.*, xxii. 127.) Twenty-five Gm. of essential oil of bitter almonds is mixed with 10 Gm. of hydrated magnesium oxide and 10 c.c. of water. A few drops of neutral potassium chromate are then added, and the mixture is titrated in the usual manner with $N/10 AgNO_3$ solution. According to Dietze the results are accurate, and the method is convenient and rapid.

Bixin. K. Zwick. (*Archiv. der Pharm.* through *Bull. Comm.*, xxix. 84.) The author thus modifies the method of Etti for the separation of the colouring matter of annatto, bixin, $C_{28} H_{34} O_5$, in a crystalline form. The dried and finely dried annatto is moistened with chloroform, packed in an extractor, and exhausted with the same menstruum for 24 hours. The chloroform is then distilled off, the residue dried on the water-bath, powdered, and extracted with

light petroleum ether, until the solvent passes colourless. The petroleum ether is distilled off, the residual extract again extracted with chloroform. On evaporation, this chloroformic extract deposits small reddish violet crystals of bixin. The author was unable to find the yellow principle orellin stated by others to occur in annatto.

Bocconia Cordata, Akaloids of. P. Murrill and O. Schlotterbeck. (*Pharm. Journ.* [4], xi. 34, *after Merck's Report.*) The authors review the chemistry of the bases of *Bocconia cordata.* They confirm the statements of previous workers that propotine is the preponderant base, for which they adopt the formula of Hesse and Eijkmann, $C_{20}H_{19}NO_5$; this base, when pure, melts at 204° C. (uncorr.), or 208° C. (corr.). Next in quantity is β-homochelidonine, $C_{21}H_{21}NO_5$, which melts at 155° C. (uncorr.), or 158·5° C. (corr.). The third alkaloid, chelerythrine, $C_{21}H_{17}NO_4 + C_2H_5OH$, exists only in small quantities, and forms lemon yellow salts and blue fluorescent solutions, the latter property becoming less as the alkaloid is purer. It is therefore probably due to a decomposition product. The sanguinarine of Eijkmann was not obtained in sufficient quantity to allow its identity to be established. Details of the methods of isolating these alkaloids are given in the abstract referred to.

Boraginaceæ, Poisonous Plants in. K. Greimer. (*Archiv,* ccxxxviii. 505.) *Anchusa officinalis, Cynoglossum officinale* and *Echium vulgare* all contain the poisonous alkaloid cynglossine, which resembles curare in its action. *Symphytum officinale* is also poisonous, containing the toxic alkaloid symphyto-cynoglossine, which has the same empirical formula as cynoglossine, but differs from it in its physiological action. A glucoside, consolidin, is also present in all these plants, which is also poisonous, and yields glucose when hydrolised, and an alkaloid, consolicine, which is more active than the original substance.

Boric Acid, Detection of. E. M. and M. L. Wade. (*Journ. Amer. Chem. Soc.,* xxii. 618.) About 10 Cgm. of the substance is heated in a test tube with 0·5 c.c. of hydrochloric acid, and 10 c.c. of methyl alcohol. Boiling is continued until the liquid is reduced to a small volume; a piece of moistened turmeric paper is held just outside the mouth of the tube during boiling, in contact with the vapour. In the presence of boric acid this will be coloured with the characteristic red tint, which is tinted pink or blue when moistened with very weak solution of ammonia.

Buchu, Volatile Oil of. Von Kondakow and Bachtschiew state (*Journ. Prakt. Chem.* through *Pharm. Zeit.*, xlvi. 194) that the best oil of buchu contains about 10 per cent. of terpenes of a pleasant lemon-like odour, consisting of a mixture of dextro-limonene and dipentene; 60 per cent. of the ketone, menthone; 20 per cent. of diosphenol melting at 82·5° C.; 5 per cent. of resin, and 5 per cent. of undetermined constituents. The oils which contain most diosphenol have a higher gravity and a lessened optical activity.

Calamine, Examination of. T. S. Barrie. (*Pharm. Journ.* [4], xi. 2.) In order to obtain a definite compound, the precipitation of hydrated zinc oxide in the presence of a little ferric chloride has been suggested. To obtain a dense powder this hydrated precipitate might be roasted. The author found the following to be the composition of three samples of calamine examined by him. No. 1 was stated to be the powdered native ore:—

No. 1. Yellowish powder.		No. 2. Pink powder.		No. 3. Pink powder with red particles.	
	Per cent.		Per cent.		Per cent.
Zinc carbonate	60·8	Zinc carbonate	73·0	Zinc carbonate	54·8
Barium sulphate	18·9	Bar. sulphate	10·9	Ignited iron oxide	3·6
Iron oxide (ochreous)	1·2	Iron oxide	3·3	Sodium sulphate	traces
Manganese dioxide,	traces	Manganese dioxide	traces	Manganese	none
Silica	19·1	Moisture, Sodium sulphate, Sodium carb.	12·8	Calcium sulphate	41·6
	100·0		100·0		100·0

Calamus Oil. H. von Soden and W. Rojahn (*Pharm. Zeit.*, xlvi. 243) have isolated from calamus oil a new crystalline body, $C_{15}H_{26}O_2$, which is probably a sequiterpene alcohol. It was obtained by fractionating Gallician calamus oil, *in vacuo*, after saponification with alcoholic potash. It distils as a thick greenish oil at 150° C. On standing for some months, it deposits colourless crystals, which, recrystallised from methyl alcohol, melt at 165–166° C., and sublime without decomposition at 105–110° C. It forms additive compounds with bromine and with hydrochloric acid, but does not acetylise with acetic anhydride.

Calcium Salts, Determination of, in drinking water. Gasselin. (*Journ. Pharm. Chem.* [6], xii. 556.) Three standard solutions are required: (1) oxalic acid, containing 0·63 Gm. per litre; (2) Potassium permanganate, containing 0·316 Gm. per litre; (3) N/10 H_2SO_4 solution. The permanganate is first standardized against the oxalic acid solution by adding 10 c.c. of the latter and 10 c.c. of the N/10 H_2SO_4 to 10 c.c. of water, warming to 70° C., and running in the permanganate until a permanent pink tint is obtained. Then 50 c.c. of the oxalic acid solution are run into a 150 c.c. flask, 2 drops of AmHO added, and 50 c.c. of the water to be tested. The flask is well shaken at intervals for ten minutes, the solution filtered, and the unprecipitated oxalic acid determined, as described above, in 20 c.c. of the filtrate. The difference in the results of the blank experiment and that on the sample, indicates the amount of oxalic acid precipitated as calcium oxalate. Every c.c. of the standard oxalic acid thus used up, is equivalent to 0·00028 Gm. of CaO.

Camphor, Determination of, in Spirit of Camphor. O. Schmatolla. (*Apoth. Zeit.*, xvi. 290.) Spirit of camphor, 10 Gm., is put into a 50 c.c. burette, graduated in 0·1 c.c., it is then shaken up with a saturated solution of sodium chloride, 30 to 35 c.c. After the camphor has, as much as possible, collected on the surface, exactly 1 c.c. of petroleum benzene is dropped on to the layer of camphor. The camphor is then dissolved in this benzene by careful agitation. After several minutes the volume of the benzene solution can be read off. After subtracting the volume of the added benzene 1·02 c.c. corresponds to 1 Gm. camphor (sp. gr. 0·98). The results are very exact compared with ordinary methods.

Camphorated Oil, Analysis of. J. F. Liverseege (*Chem. and Drugg.*, lviii. 167) confirms his own previous statement, that the observed rotation of camphorated oil in a 200 mm. tube, less 0·2, indicates when olive oil is the vehicle, the amount of camphor present. The following formulæ are given for the calculation of the amount of camphor in solution in any of the commonly met with oils:—

If the result is required to be expressed as grammes of camphor per 100 grammes of liniment, the following formulæ may be used:—

$$p = \frac{100\,(L - o)}{(C - o)\,(S + kp)} \text{ or } \frac{100\,(L - o)}{(C - o)S + (C - o)kp}$$

p=Percentage by weight of camphor in liniment.

L=Degrees of rotation produced by liniment in 200 mm. tube with sodium flame.

C=Calculated rotation for camphor.

o=Rotation of olive or other oil in 200 mm. tube.

S=Sp. gr. of olive oil or other oil.

k=Increase in sp. gr. produced by 1 per cent. of camphor.

Experiments on nine solutions of camphor in various oils indicate that 108° is the most probable value for C, and that k may be taken as equal to 0·0004. In the second half of the divisor p may be replaced by L, and the formula may be written:—

$$p = \frac{(L - o)}{(108 - o)\ 0{\cdot}01\,S + 0{\cdot}00043\,L}$$

The table below gives a number of determinations of the values of the first part of the divisor (C — o) 0·01 S:—

Oil.	Rotation, 200 mm. (o)	Sp. Gr. (S)	(108—o) 0·01 S
Olive A	+0·2°	0·917	0·988
Olive B	+0·4°	0·915	0·984
Olive C	+0·3°	0·917	0·987
Colza	—0·1°	0·915	0·989
Sesame A.	+0·5°	0·925	0·995
Sesame B.	+0·9°	0·922	0·988
Arachis A	—0·1°	0·916	0·991
Arachis B	0	0·917	0·990
Arachis D	+0·1°	0·917	0·989
Cottonseed A	—0·1°	0·928	1·004
Cottonseed B	0	0·940	1·016
Cottonseed C	0	0·939	1·015
Cottonseed E	0	0·922	0·996
Mineral A	+1·0°	0·904	0·968
Mineral B	+1·0°	0·897	0·960

In determining the amount of camphor by the evaporation method, the author advocates simple exposure of about 3 Gm. of the sample in a flat bottom dish for two or three hours on the water bath. This method gives results approximating to the amount of camphor present with vegetable oils, other than olive oil, but with camphorated mineral oil the results are markedly

too high, due to loss of weight of the oil. The other analytical constants of camphorated oil, prepared with the commoner oils were found to be as follows:—

Oil Used.	Camphor per cent.	Oil per cent.	Sp. gr.	Iodine value per cent.	Potash absorbed per cent.	Valenta Test, Deg. C.	Titre of fatty acids, Deg. C.
Olive . . .	21·8	78·2	0·926	66	15·2	51	25
Arachis A .	21·6	78·4	0·927	71	15·3	54	29
Arachis D .	21·6	78·4	0·926	69	15·2	60	—
Sesame . . .	21·1	78·9	0·933	92	15·6	32	28
Colza . . .	21·5	78·5	0·924	81	13·6	83	14
Mineral . .	21·6	78·4	0·910	11	0·03	*	—

* Not dissolved at 115° C., the boiling point of the mixture.

That camphorated oil is fairly permanent when properly stored, is shown by the following figures afforded by a specimen of the oil made in May, 1897.

Age.	Rotat'on 200 mm.	Percentage of camphor.	Loss on Heating.
New	22·0°	21·6	
Nine weeks	21·1°	20·7	—
Two-and-a-half years .	21·0°	20·6	20·5 per cent.

Canada Balsam, Constituents of. A. Tschirch and E. Bruening. (*Archiv*, ccxxxviii. 487.) By shaking out the ethereal solution of the oleoresin of *Pinus canadensis* with ammonium carbonate solution, about 13 per cent. of canadinic acid, $C_{19}H_{34}O_2$, is removed. Subsequent treatment with sodium carbonate removes three more acids; a small amount, about 0·3 per cent. of crystalline canadolic acid, $C_{19}H_{28}O_2$; and from 48 to 50 per cent. of two amorphous acids, α- and β-canadinolic acids, $C_{19}H_{30}O_2$. There remains insoluble from 23 to 24 per cent. of volatile oil, and from 11 to 12 per cent. of resene, $C_{21}H_{40}O$, with traces of succinic acid.

Carbon Tetrachloride as an Alkaloidal Solvent. J. Schindelmeiser (*Pharm. Zeit.*, xlvi. 193) has enquired into the reputed value of carbon tetrachloride as an alkaloidal solvent, particularly with regard to its application as a substitute for chloroform. He states that it has one unfavourable property when used for shaking out alkaloidal extracts in the course of toxicological work, in that it is

prone to form inseparable emulsions, which cannot be broken down even by the use of a relatively large quantity of alcohol. Another point is that commercial CCl_4, almost invariably contains traces of CS_2, consequently it is necessary to submit it to fractional distillation before using, only the portion boiling at 76° C. being employed. The author gives the solubility of the alkaloids specified in each 100 parts by weight of CCl_4 at 17° C. as follows. Morphine 0·032, codeine 1·328, papaverine 0·203, narceine 0·011, atropine 1·136, cocaine 18·503, strychnine 0·645, brucine 1·973. Veratrine is very soluble, even 60 parts being taken into solution by 100 of the solvent, but the latter is very difficult to dissipate by evaporation. By Hilger and Kuester's method CCl_4 gives good results, since the alkaloidal residue obtained on evaporating the solvent is very pure and free from contamination.

Carbonates, determination of, in the Presence of Bicarbonates. K. Cameron (*Pharm. Zeit.*, xlv. 482) employs a normal solution of potassium acid sulphate, using phenolphthalein as the indicator, for the titration of normal carbonates in the presence of acid carbonates, basing the calculations on the equation—

$$Na_2CO_3 + KHSO_4 = NaHCO_3 + NaKSO_4.$$

Potassium acid sulphate is without action on bicarbonates.

Cardamoms, Essential Oil of. M. W. Allen and E. T. Brewis. (*Pharm. Journ.* [4], xii. 328.) The authors compare cardamom oil of their own distillation with the oils from other varieties of cardamoms, as well as with two samples of foreign origin. Parry's paper read at the Plymouth Conference (Year-book 1899, 457) dealt with the oils obtained from Ceylon Malabars and Ceylon Mysores. While his figure for sp. gr., which was the same for both oils, 0·9418, practically agrees with 0·9479, the figure obtained on the authors' normal oil, the optical rotations found by him, + 40°·68 (+ 40° 41′) and + 46°·65 (+ 46° 39′) respectively, are considerably higher than that usually obtained by them, + 30°·50.

Cardamoms, Percentage of Ash in. H. G. Greenish. (*Pharm. Journ.* [4], xii. 264 and 393.) As the result of a long series of experiments it is found that the official limit of 4 per cent. of ash is too low, and the minimum limit cannot be fixed at lower than 5·54 per cent. The average percentage of ash from the whole fruit, as found by a number of determinations on a large assortment of cardamoms, falls so close to this figure as to show that it is of little or no value in differentiating between the seeds and fruits in the powdered state. This however may be readily

effected by microscopical examination, and drawings of the distinctive histological elements are given. It is suggested that the following description might be included in the official monograph. "Powdered cardamoms, when examined under the microscope, should exhibit masses of thin-walled parenchymatous cells packed with minute starch grains; long straight epidermal cells with moderately thick walls, and small polygonal reddish brown cells with very thick walls. It should be free from schlerenchymatous fibres or elongated cells, or small cells containing brown resin."

Cardamom seeds, the Ash of. R. C. Cowley and T. P. Catford. (*Pharm. Journ.* [4], xii. 426.) The authors state that the black insoluble residue obtained from cardamom ash consists of metallic phosphides. They also indicate cobalt as a constituent of the ash. In general, they express the opinion that the method of determining ash should be prescribed, or discordant results will be obtained. Thus in the case of cardamoms, results vary from 8 to 3 per cent., according to the method of procedure.

Carvone, Determination of, in essential oils of Spearmint and Caraway. E. Kremers. (*Journ. Soc. Chem. Ind.*, xx. 16.) To 10 Gm. of the oil, dissolved in 25 cc. of alcohol (and contained in a 500 cc. flask), 5 Gm. of hydroxylamine hydrochloride and 6·5 Gm. of sodium bicarbonate are added. The mixture is boiled for half an hour on a water bath, the flask being connected with a reflux condenser. Twenty-five c.c. of water are then added, and the alcohol, which carries over a large quantity of the limonene, etc., is distilled off from the water bath. Steam is then passed through the liquid until traces of carvoxime come over. As soon as the bulk of the alcohol and limonene have come over, the distillate is collected in small fractions (5 to 10 c.c.) in test tubes, and when traces of the crystalline oxime appear on the surface the operation is interrupted. (Even if the oxime should not crystallize readily, the operator will after a little experience know when to stop the distillation.) The tube of the condenser is then washed with a little hot water, and this, as well as the last collected distillate containing some crystalline carvoxime, returned to the flask. (If, after standing for a day, any of the other fractions contain crystalline oxime, this is naturally added to the bulk of the carvoxime before being finally dried and weighed.) The contents of the flask are then allowed to cool, and after the carvoxime has completely solidified it is removed carefully from the sides of the flask by means of a loop of stiff wire, transferred to a force filter,

washed, and dried by suction. The air-dried carvoxime is then transferred to a tared glass capsule, heated for an hour on a water bath, and, when cool, weighed. To the weight thus obtained 0·100 Gm. is added, as this is approximately the quantity of oxime lost during the process of drying for an hour. The weight of carvoxime when multiplied by 0·9088 gives the weight of the equivalent amount of carvone.

Cascarilla, volatile oil of; Constituents of. G. Fendler (*Archiv*, ccxxxviii. 671) has isolated a new acid from the high boiling portion of cascarilla oil, $C_{11}H_{20}O_2$, which is named cascarillic acid. It boils at 268°–270° C. It is a yellow oily liquid with a peculiar odour resembling that of butyric acid, and does not congeal below —15° C. The sp. gr. at 20° is 0·9324. It is accompanied by small quantities of palmitic and stearic acids, from which it is separated by means of the solubility of its lead salt in ether. Although the new acid has the same empirical formula as undecylinic acid, it differs markedly from that body, which readily congeals, remelting at 24·5° C. and boiling at 295° C. The other constituents of cascarilla oil are, eugenol 0·3 per cent., terpene (b. p. 155–157° C.) 10 per cent., lævo-limonene 8·8 per cent., cymol 13·2 per cent., sesquiterpene (b. p. 255 to 257° C.) 10·5 per cent., sesquiterpene (b. p. 260–265°) 33 per cent., sesquiterpene alcohol $C_{15}H_{23}HO$ 11 per cent., high boiling oxygenised portion 10 per cent., resin 1·1 per cent.

Cassava, Prussic Acid in. J. Carmody. (*Lancet*, 4019, 736.) Prussic acid is a constituent of both sweet and bitter cassava, but is present in the former in greater quantity in the cortical portion while in the latter it is evenly distributed throughout the whole root. The inner part of the tubers of sweet cassava yielded from 0·003 to 0·015 per cent. of HCN, while the cortical layer contained 0·014 to 0·042 per cent. Bitter cassava gave from 0·014 to 0·035 both from the inner and outer portion. As the acid appears to result from a fermentative or hydrolytic change, it would appear likely that cassava starch, on keeping, would be more poisonous than when freshly prepared.

Castor oil. Edwin Dowzard (*Chem. Drugg.*, lviii. 325) gives the following limits for the constants of castor oil: sp. gr. at 15·5° C. 0·960 to 0·967; optical rotation, in a 200 mm. tube at 16° C., + 8° to + 9°; refractive index (by Annagat and Jean's oleo-refractometer) at 22° C. + 39° to +42°; solubility in alcohol (90 per cent.) 1 in 3 to 1 in 4; solubility in petroleum ether, *nil*; saponification (total acid) number, 175 to 182; viscosity 1·160 to 1·190 seconds for 50 c.c. at 37·7° C.; acetyl number about 150.

The author points out that the B. P. limits—0·950 to 0·970 for sp. gr.—are too wide. A medicinal oil having a gravity below 0·958 is almost sure to be adulterated. He also controverts the statements of Allen that the oil is optically inactive, confirming the figures recorded by Redwood and Deering for the Indian variety, + 7·6° to + 9·7° in 200 mm. From these marked characters, differing widely from those of other oils met with in commerce, the purity of castor oil is easily established.

Cellose, a Cellulose Biose. Z. H. Skaup and J. Koenig (*Chem. Centr.*, lxxii. 1197) consider that the sugar obtained by Nasturkoff by the hydrolysis of oxycellulose is identical with their cellose. On acetylising cellulose with acetic anhydride in the presence of sulphuric acid, an acetate is obtained identical with Franchimont's acetylised triglycose. This is considered by the authors to be derived from a monose on account of its molecular weight, as shown by cryoscopic determinations. On saponifying this ester, a sugar is liberated which is readily soluble in water, which yields cellose, but no mannose, in the form of a white powder consisting of irregular microscopic prisms and tablets with a faintly sweet taste, soluble in cold water 1:8, and sparingly dissolved by alcohol. It reduces Fehling's solution, but does not readily ferment with yeast. It shows a very marked bi-rotation: after ten minutes the $\alpha_D = 26{\cdot}1°$; in fifteen hours 33·7°. From these results it is considered as proved that cellulose cannot be regarded as a polymer of starch, but as a distinct chemical substance.

Chlorine in Rain Water. E. Kinch. (*Journ. Chem. Soc.*, lxxvii. 1271.) Having observed the amount of chlorine in the rain water collected in the rain gauge of the Meteorological Station at Cirencester over a period of 26 years, the author finds that the amount is equivalent for that period to a yearly deposit of 36 lbs. of common salt per acre; and during the past 14 years to 30 lbs. per acre. The total deposit of chlorine from this source is distinctly greater in the winter than in the summer, being influenced by the S. W. gales blowing from the Bristol Channel. A table is given showing the rainfall and its chlorine content for every six months from 1887 to 1900.

Chloroform of Crystallisation. G. Kassner. (*Archiv der Pharm.*, ccxxxix. 44.) In the course of a research on the colouring matter, leprarin, derived from the lichen *Lepraria latebrarum*, it was found that when the body was crystallised from chloroform it separated slowly in the form of fine yellowish transparent tablets in which one mol. of $CHCl_3$ was combined in the form of

chloroform of crystallisation, represented by the formula $C_{19}H_{18}O_9 + CHCl_3$. On exposure to the air, these crystals slowly became opaque, due to loss of $CHCl_3$. The occurrence of crystalline compounds containing $CHCl_3$ has been recorded before. Thus Schmidt has described berberine chloroform $C_{20}H_{17}NO_4 + CHCl_3$, and Zeisel, colchicine chloroform $C_{22}H_{25}NO_6 + 2CHCl_3$.

Cinchona Bark, a new method for the Alkaloidal Assay of. B. A. van Kettel. (*Zeit. f. angew. Chem.*, xiv. 313.) 4 Gm. of bark in fine powder is well mixed in a mortar with 2 Gm. of calcium hydrate; 4·5 to 5 c.c. of AmHO is gradually added with mixing until the powder is uniformly moistened. The mass is then boiled with 125 c.c. of ether for half an hour in an Erlenmayer flask with reflux condenser, the solution filtered through cotton wool into a separator, washed with about 80 c.c. ether, the ethereal solution shaken out for 3 minutes with 10 c.c. of 10 per cent. HCl, the alkaloidal solution drawn off, the ether again washed with 5 c.c. of water, the aqueous acid solution made alkaline with NaOH, and first shaken out with 70 c.c. ether, then with 5 c.c. The bulked ethereal extract is washed with 2 c.c. water, the ether evaporated off in a small flask and the residue weighed after being dried for one and a half hours in the water oven. The process is suitable for all drugs the alkaloids of which are soluble in ether, and are not volatile.

Cinchotoxine and Quinotoxine. W. v. Miller and G. Rhode. (*Berichte*, xxxiii. 3214.) By heating cinchonine with acetic acid under a reflux condenser for 36 hours, the base undergoes a molecular change, and the isomeric cinchotoxine is formed. This is identical with the cinchonicine of Pasteur, the difference in crystalline form from that body being due to dimorphism. Quinotoxine, which is the quincine of Pasteur, is obtained from quinine in a similar manner. Quinotoxine is not itself crystalline, but gives crystalline salts.

Cinnamic Acid, Detection of, in Benzoic Acid. A. Jorissen (*Annales de Chim. Analyt.*, vi. 41) avails himself of the fact that salts of uranium in the presence of sunlight, act as oxidisers on cinnamic acid producing benzaldehyde, which may be recognised by its odour. A few decigrammes of the acid under examination is suspended in a few c.c. of 5 per cent. uranium acetate solution, in a small corked flask, and exposed to direct sunlight. In the presence of cinnamic acid a marked odour of benzaldehyde will be developed. When only a small amount of cinnamic acid is present, 1 Gm. of the sample is heated to boiling in 10 c.c. of water.

After cooling, the solution is filtered, and the last portion of liquid removed by slight pressure. The mother liquor thus obtained is added to the uranium acetate solution as described above and exposed to sunlight. In this way the presence of 1 per cent. cinnamic acid as an impurity in benzoic acid may be detected.

Citral, and other Aromatic Constituents of Essential Oils, Colour Reaction for. H. Burgess (*Journ. Pharm. Chim.* [6], xiii. 283) obtains distinctive colour reactions with various constituents of essential oils by means of a solution of mercuric sulphate 10 Gm., in sulphuric acid 25 per cent., 1 litre. With this, *Citral* gives a bright red on shaking, disappearing rapidly and leaving white flakes in the aqueous portion. *Citronellal*, a bright yellow, which is fairly stable. *Limonene*, a fugitive, very pale flesh colour, leaving a white compound. *Lynalyl acetate*, permanent violet. *Linalool*, immediate deep violet. *Caryophyllene*, yellow compound. *Eugenol*, faint violet colour on standing some minutes. *Terpineol*, flesh colour and precipitate.

Cobalt, Determination of small quantities of, in the Presence of Nickel. T. Moore. (*Chem. News*, lxxxii. 73.) The solution containing the chlorides of the two metals should not have much free acid, and if, as is usually the case, a little iron is present, it should be eliminated by precipitation with a slight excess of zinc oxide and filtered off. The filtrate is now diluted to 300 or 400 c.c. with water, one drop of hydrochloric acid added, and raised to the boiling point or nearly so; now add sufficient bromine water, and then not too much zinc oxide; a large excess only hinders the subsequent filtration, but is not otherwise detrimental. The solution is now boiled for about five minutes or until the greater part of the bromine is expelled; then filter, and wash precipitate thoroughly with boiling water. The precipitate is now washed as perfectly as possible from the filter into a beaker, the trace adhering to the filter-paper being dissolved off by very weak hydrochloric acid containing a very little sulphurous acid; the filtrate, which need not exceed 5 c.c., being received in a capsule, evaporated to dryness, then dissolved in a few drops of water, and added to the main precipitate. The precipitate is now well boiled to thoroughly disintegrate it, and then allowed to become cold. When cold, 5 to 10 c.c. of hydrogen peroxide, which has been rendered strongly alkaline with caustic soda, is added, the mixture well stirred, and then boiled for two or three minutes to destroy the excess of peroxide, then allowed to cool, after which it is digested for five minutes in a stoppered

bottle with potassic iodide and hydrochloric acid, and the iodine thus set free titrated by means of a very weak solution of sodic hyposulphite. $I \times 0{\cdot}46511 = Co$.

The following results were obtained in presence of 2 Gm. of metallic nickel perfectly free from cobalt.

Cobalt employed.	Cobalt found.
0·0001 Gm.	0·00012 Gm.
0·0004 „	0·00041 „
0·0008 „	0·00078 „
0·0010 „	0·00104 „
0·0020 „	0·00201 „
0·0050 „	0·00500 „

Cobalt Selenides. Fonzes Diaçon. (*Comptes rend.*, cxxxi. 704.) By passing selenuretted hydrogen over cobalt oxide at various temperatures and for different periods of time, the four selenides $CoSe_2$, Co_2Se_3, Co_3Se_4, and CoSe are obtained. Of these only Co_3Se_4 has been obtained in a crystalline condition. It forms a mass of small brilliant, greyish violet, cubical octahedra. By reducing the above selenides with hydrogen at a high temperature, another selenide, Co_2Se, is obtained. Cobalt seleniate similarly reduced yields several oxyselenides and a mixture of metallic cobalt and selenides.

Coca Leaves, Alkaloidal Assay of, with Petroleum. U. R. Lamare. (*Amer. Journ. Pharm.*, lxxiii. 125.) The following modification of Squibb's method, employing kerosene as the extraction medium, is recommended as giving good results. Twenty-five Gm. of the finely powdered leaves are put into a wide mouth stoppered flask of 450 c.c. capacity, and evenly moistened with 25 c.c. of 2 per cent. solution of ammonia. This is left, with occasional agitation, for half an hour. Kerosene oil 75 c.c. is then gradually added, and the whole allowed to stand for an hour or more, with agitation every ten minutes. The whole is then packed in a percolator, and extracted with kerosene oil. When exhausted the percolate is shaken with 25 c.c. N/10 hydrochloric acid, for about ten minutes. After allowing to stand for about twenty minutes the watery layer and emulsion zone are separated from the oily layer, and the treatment with the acid is repeated. The bulked acid solution is now shaken out with 20 c.c. ether, the watery layer run off and again treated with ether 15 c.c. to take out the last traces of oil and colouring matter. The aqueous solution is then very carefully separated and the ether washed out

twice with water 5 c.c., adding the washings to the acid solution. This is then made slightly alkaline with 8 to 9 c.c. of solution of ammonia 2·5 per cent., and the pure alkaloid is extracted by three times shaking out with ether in successive quantities, of 40, 30 and 30 c.c. The amount of alkaloid in the ethereal extract is then either determined by titration or the solvent is evaporated off, and the residue weighed after drying for three hours at 60° C.

Copper in Reduced Iron. E. F. Harrison (*Pharm. Journ.* [iv.], xii. 371) reports the presence of copper as an impurity in reduced iron. Of nine samples examined, only one of English and one of German origin were free from impurity, and one from the latter source contained an appreciable amount of antimony. The percentage of copper found varied from a trace up to about 0·4 per cent.

Cocaine, Determination of, as Di-Iodococaine. W. Garsed and J. N. Collie. (*Proc. Chem. Soc.*, xvii. 89.) Advantage is taken of the fact that cocaine forms a very stable insoluble di-iodohydriodide, $C_{17}H_{21}NO_4HII_2$, so that by adding an excess of decinormal iodine to a solution containing a salt of cocaine, and then titrating the excess of iodine in the usual manner, the amount of cocaine may be determined, or the diiodo-compound may be collected and weighed. Ecgonine does not interfere with the results since it forms soluble iodo-compounds. Benzoyl-ecgonine however interferes, and should be removed by treating the liberated bases with petroleum ether or ether, in which only cocaine is soluble.

Copper Selenides. H. Fonzes Diaçon. (*Comptes rend.*, cxxxi. 1206.) By heating $CuCl_2$ to 200° C. in H_2Se long bluish black needles of CuSe are obtained. Cu_2Se is obtained by the same means at a higher temperature, or by substituting Cu_2Cl_2 for $CuCl_2$. It occurs in minute octahedra. It is also formed on heating the long crystals of CuSe, which are then converted into a string of octahedra of Cu_2Se.

Copper and Lead Sulphides. F. Bodroux. (*Comptes rend.*, cxxx. 1395.) When a dilute (1 per cent.) solution of a copper or lead salt is cooled to 0° C. and precipitated at that temperature with a dilute solution of calcium polysulphide, filtered rapidly, at a low temperature, excess of sulphur removed with cold CS_2 and dried *in vacuo*, over H_2SO_4 at 0° C., a reddish brown precipitate, stable for a time at ordinary temperatures, and having the constitution Cu_2S_5, is obtained. This slowly decomposed into CuS and S. Under similar conditions lead salts for a purple red precipitate of

lead pentasulphide, PbS_5, which is stable below 10° C. but rapidly decomposes above that temperature.

Corydalis Cava, Alkaloids of; Conversion of Corybulbine into Corydaline. J. J. Dobbie, A. Lander and P. Paliatseas. (*Journ. Chem. Soc.*, lxxxix. 87.) Corydaline and corybulbine are found to be related to each other precisely as morphine and codeine; differing from each other by one CH_2 group, so that corydaline is the higher homologue of corybulbine. When the two bases are treated with hydriodic acid the phenolic derivatives yielded are found to be identical. By treating corybulbine with methyl iodide in the presence of potassium hydroxide it is easily converted into corydaline, which is identical in every respect with the natural base.

Crystallising Difficultly Crystallisable Substances. A. Ruempler (*Berichte*, xxxiii. 3474) employs the following method of obtaining crystals of bodies which are soluble in water but not so soluble in alcohol. To the aqueous solutions alcohol is added, until a slight turbidity is produced. The liquid is then placed under a bell-jar, over quicklime, which slowly absorbs the aqueous vapour, so that the mother liquor becomes more strongly alcoholic. In this way crystals are slowly formed of such bodies as peptone and arabic acid. The method may be serviceable in the isolation of similar organic substances.

Cynoglossum Officinale, Two Alkaloids of. Vouranzos (*Repertoire* [3], xi. 105) states that the roots of *Cynoglossum officinale* contain two alkaloids, cynoglosseine, and cynoglossidine. The first named was isolated by extracting the powdered roots with warm water, precipitating the aqueous extract with excess of ammoniacal lead hydrate, collecting the precipitate, washing with alcohol, drying, and decomposing with dilute sulphuric acid. After filtering and removing the lead with H_2S, and decolourising with animal charcoal, the sulphate of a base was obtained in crystals on evaporation. From these the alkaloid was liberated with AmHO or Ba2HO, and crystallised from amylic alcohol. It then formed small prisms melting at 115° C. It was very soluble in water, less so in alcohol, and nearly insoluble in ether. It had a faint alkaline reaction and its solutions were dextrorotatory. It exists in the root to the extent of 2·5 to 3 per cent. After the removal of the cynoglosseine by water, the dried powdered root on further extraction with boiling ether, yielded cynoglossidine. This was purified by digesting in alcoholic solution, with animal charcoal, then precipitated by the addition of water. In this way it was

obtained as a brownish bitter crystalline powder melting at 138° C. Its solutions were without action on polarised light. It is soluble in alkalies, giving salts of "cynoglossic acid," which is stated to be a stereo-isomer of phenylhydracylic acid. Cynoglossidine is present in the root, of which it forms the active principle, in greater proportion than cynoglosseine.

Damascenine. H. Pommerehne (*Archiv der Pharm.*, ccxxxvii. 457 and ccxxxviii. 531) finds that damascenine, derived from the seeds of *Nigella sativa*, has the formula $C_9H_{11}NO_3$, and not $C_{10}H_{15}NO_3$, as stated by Schnieder. The crushed seeds were exhausted by successive maceration at 30° to 40° C., with dilute HCl, the acid extract being strained off without pressure. The liquid thus obtained was rendered alkaline with sodium carbonate, and the liberated alkaloid shaken out with successive portions of petroleum ether, in which it is soluble, giving a solution with a fine fluorescence. From this petroleum ether extract the alkaloid was removed by repeated shaking out with dilute HCl. The acid solution was evaporated until the hydrochloride of the alkaloid crystallised out. This was purified by re-solution, treatment with animal charcoal, and crystallisation. It contained 1 mol. H_2O. The base liberated from this salt and dissolved in ether, occurred as a white syrupy liquid, which at low temperatures gradually became converted into a mass of crystals. Recrystallised from alcohol it formed slightly yellow prisms, with a bluish fluorescence and a peculiar narcotic odour, which melt at 26° C. A series of crystalline salts were prepared. When heated in sealed tubes with methylic alcohol and methyliodide, the iodomethylate, $C_9H_{11}NO_3CH_3I + 2H_2O$, crystallising in colourless spangles, was formed. The platinochloride of this new body melted at 181° to 182°, and its aurochloride at 153 to 155° C.

Damascenine, Action of Alkali on. H. Pommerehne. (*Archiv der Pharm.*, ccxxxix. 34.) When the salts of alkaloid damascenine are heated with alcoholic potash, true saponification does not take place, but the base is isomerised, being converted into an acid. The reaction between the base and alkalies may be represented by the equation $(C_9H_{11}NO_3HCl + H_2O) + 2KOH = KCl + C_9H_{10}KNO_3 + 3H_2O$. After removing the unacted-on alkaloid by shaking out with the ether, and then liberating the combined portion by treatment with acetic acid, and again shaking out with ether, the new acid was obtained in a crystalline condition in the form of quadratic tablets which, when air-dried, contained 3 mols. H_2O and melted at 76°–77° C., but when rendered an-

hydrous by drying over H_2SO_4 at 50° C. melted at 140°–141° C. The acid had the formula $C_9H_{11}NO_3$. The reaction is quantitative with alcoholic potash at ordinary atmospheric pressure, and takes place partially even with acid carbonates at ordinary temperatures.

Darwinia, Essential Oils of. R. T. Baker and H. G. Smith. (*Proc. Roy. Soc. of New South Wales*, 1899. Through *Schimmel's Report*, Oct. 1900, 19.) The volatile oil of *Darwinia fascicularis*, obtained to the extent of 0·3 to 0·8 per cent. from the fresh leaves and twigs, in the form of a dark coloured liquid of pleasant odour, had the sp. gr. 0·923 and the rotation + 1° 10′. It contained between 57 and 65 per cent. of geranyl acetate and about 13 per cent. of a readily acetylised alcohol, which was probably geraniol. *Darwinia taxifolia* also yielded an oil to the extent of 0·315 per cent., having the sp. gr. 0·87134 at 21° C. and the opt. rot. – 6·5: the saponification number is 14·5 to 16. The whole, except about 5 per cent., boiled between 165 and 255. The lighter portion consisted of lævo-pinene. The alcohol is probably linalool.

Datura Stramonium; Egyptian. W. R. Dunstan and H. Brown. (*Proc. Chem. Soc.*, xvi. 207.) The plant, which is plentiful in the Egyptian deserts, has yielded the author 0·35 per cent. of hyoscyamine in a pure state free from other alkaloids.

Dimethyl-diacetyl-acetone, Tetramethyl-pyrone and Orcinol Derivatives of Diacetyl-acetone. J. N. Collie and B. D. Steele. (*Journ. Chem. Soc.*, lxxvii. 961.) Having shown previously that dimethyl-pyrone is capable of acting as a basic body, it was thought that probably other pyrone compounds would be found to behave in a similar manner. For this reason tetramethyl-pyrone was prepared, which, from the greater number of methyl groups, was expected to form salts with even greater ease than dimethyl-pyrone; but such was not found to be the case. Tetramethylpyrone, $C_9H_{12}O_2$, mp. 92, was obtained among other products by the action of methyl iodide on di-sodium diacetyl-acetone; the following bodies were also formed: dimethyl-diacetyl-acetone, $C_9H_{14}O_3$, mp. 86–87; tetramethyl-pyrone hydrate, $C_9H_{14}O_3$, mp. 63–64; two trimethyl dihydroxybenzenes, $C_9H_{12}O_2$, one melting at 156, the other at 105–106; trimethyl-pyrone, $C_8H_{10}O_2$, mp. 78; and dimethylaceto-dihydroxy-naphthalene, $C_{14}H_{14}O_3$, mp. 183–184.

Disinfectants, Quantitative Examination of. F. W. Alexander. (*Lancet*, 3986, 159.) *Method of Testing* 35 *per cent. disinfecting fluid.* One hundred c.c. of the fluid to be tested is placed in a small flask and enough dilute H_2SO_4 (one part

H_2SO_4 in three) added to neutralise it. About 9 c.c. is found to be necessary. It is warmed and well shaken, then put into a separator, and then, after standing a few minutes, the lower aqueous portion is drawn off. The increase in volume being noted, it is neutralised with dilute caustic soda (of a sp. gr. of 1·210) and the volume of the resulting pyridine bases read. Subtract this from the increase in volume and the amount of water (first portion) is obtained. The oily upper portion is then run into a Würtz flask fitted into Liebig's condenser and distilled up to 270° C. To prevent bumping, some pieces of marble or limestone are put into the flask before commencing to distil. When all the water is distilled over (which may be noted by the cessation of frothing) the distillation is slackened for a moment to allow of the water being read. This, added to the first portion, gives the total water. The distillation then goes on up to 270° C. and the tar-oils come over with the acids in solution. The total distillate is then placed in a small flask and washed with three washes of dilute caustic soda—(1) of a sp. gr. of 1·125 (30 c.c.), (2) of a sp. gr. of 1·210 (20 c.c.), and (3) of a sp. gr. of 1·210 (20 c.c.). The distillate is warmed and well shaken with each wash, then put into a separator, and after standing a few minutes the lower portion is drawn off each time into a graduated cylinder (stoppered) in which it is neutralised by the careful addition of dilute H_2SO_4, and in which the tar acids obtained may be read. A further wash of 20 c.c. dilute caustic soda (1·210) may be given to see if all the tar-acids are removed, and after this a wash of 15 c.c. of dilute H_2SO_4 is put in the oil, the mixture warmed and shaken, separated into a graduated cylinder, neutralised with soda (1·210), and the resulting pyridine bases added to those formerly obtained give the total percentage of pyridine bases in the fluid.

Method of Testing Disinfecting Powder. Fifty Gm. of the powder is weighed into an ordinary retort, and directly distilled into a 100 c.c. graduated measure (or a 50 c.c. measure will do). Care must be taken to apply the heat gradually at first, so as not to crack the retort. First, the water distils off, and secondly, the phenols. The heating is continued as far as possible, and the resulting volume of water and phenols is read in the measure. Before finally discontinuing the distillation it is usual to shake the powder in the retort up well and again heat. Then the percentage of phenols in the powder is to the amount read as 10·5: 10; :: amount of c.c. of phenols read × 2 : percentage of phenols in powder by weight. This is necessary as the sp. gr. of phenol is

about 1·050. This method is not applicable to a powder in which the phenols are combined with the base, or to a powder having, as a base, peat or any other substance which can be destructively distilled. To find if the distillate be phenols or neutral oils, treat with about seven times its own volume of caustic soda (of a sp. gr. of 1·125), when, if phenols, they should dissolve.

Echinops, Constituents of. Greshoff. (*Chem. Centr.*, lxxii. 784.) From the seeds of various species of *Echinops*, a new toxic alkaloid, $C_{11}H_9NO$, has been isolated, crystallising with one molecule of water in the form of rhombic needles, and also in the anhydrous state in needles. The latter melt at 152° C. Among the numerous salts described the picrate melts at 215° C.; the double mercuric hydrochloride at 204° C.; and mercuric iodide double salt at 178° C. Other bases are also present: β-echinopsine, melting at 135° C.; echinopseine and echinopsfluoresceine.

Emodin, the Purgative Principle of Certain Drugs. A. Tschirch. (*Chem. Zeit. Repert.*, xxv. 90.) Emodin is the chief active principle in Chinese, Austrian, and English rhubarb, the bark of *Rhamnus purshiana*, *R. frangula*, and the fruits of *R. catharticus*, also in the leaves of various species of *Cassia*. It is usually accompanied by chrysophanic acid (dihydroxy-methyl-anthraquinone), $C_{15}H_{10}O_4$; and rhein, tetra-hydroxyl-methyl-anthraquinone, $C_{15}H_{10}O_6$. It exists in several isomeric forms. Thus the emodin from aloes and senna differs from that of the rhamni and the rhei: the first named gives a violet colour reaction on heating with concentrated H_2SO_4 until acid fumes are given off and then diluting with water and neutralising with ammonia. Rhubarb- and rhamno-emodin similarly treated give a cherry red colour. Emodin is not present in these drugs in a free state, but in the form of glucosides, which are capable of hydrolysis.

Erysimin. Schlagdenhauffen and Reeb have found (*Comptes rend.*, cxxxi. 753) that several members of the genus *Erysimum*, which have bitter seeds, contain a bitter glucoside, erysimin, $C_4H_7O_2$. After removing the oil by means of petroleum ether, the powdered seeds were extracted with alcohol, the solvent distilled off, and the soft extract left exhausted with water. The filtered aqueous solutions were evaporated to a syrupy consistence, and the glucoside salted out with sodium sulphate, the precipitation being repeated several times. The impure glucoside was then dissolved in alcohol, evaporated to dryness, redissolved in water, the solution precipitated with lead acetate, filtered, excess

of lead removed by a slight excess of sulphuric acid; then neutralised with ammonia, again evaporated to dryness, and finally extracted with alcohol. The pure glucoside thus obtained was amorphous, of a pale yellow colour, and bitter taste; it reduced Fehling's solution after hydrolysis with dilute HCl. When injected hypodermically into frogs, pigeons, and guinea pigs, it acts as a powerful poison, diminishing the heart-beats like digitalin. It is interesting as being one of the few powerfully toxic substances isolated from the *Cruciferæ*. In addition to this glucoside, the authors state that a toxic alkaloid is also present in the seeds.

Ethyl Nitrite solutions, Causes of Instability in. T. F. Harvey. (*Chem. and Drugg.*, lviii. 833.) The loss of strength of alcoholic solutions of ethyl nitrite are found experimentally to be:—

1st. Simple volatilisation, chiefly into the air-space of a partially filled bottle. The partially filled bottle determines far more loss than the occasional removal from a full bottle of the cork or stopper for a few seconds. Heat, of course, accentuates it.

2nd. The decomposition, with breaking down of the molecule, caused by daylight. This action is very intense, but can be almost entirely prevented by using bottles of amber-coloured glass—blue or green are useless.

3rd. The decomposition which ensues in the presence of oxygen (light being excluded), and which appears to be connected with hydrolysis.

It is worth while to emphasise the influence of a trace of mineral acid in promoting hydrolysis, which does not seem to occur, or only very slowly, in a neutral 80 per cent. alcohol solution. It might, therefore, be found possible to preserve pure ethyl nitrite in 90 per cent. alcohol solution, provided both substances were perfectly neutral.

The action of glycerol, which has been recommended as preventing loss and retarding acidity, is also worth fuller investigation.

Lastly, it is of high importance that samples collected under the Food and Drugs Acts should be properly taken. I have seen, for instance, bottles only one-fourth full, and sometimes only one-eighth full, left by an inspector as the vendor's sample.

All inspectors' bottles intended to receive spt. æth. nit. should be—

1. Dry.
2. Of suitable size, so that they are completely filled.
3 Of amber glass, or else wrapped in brown paper and sealed.

4. Securely closed. If corks are used they should be of irreproachable quality.

5. No sample should be put in a warm place.

Eucalyptus Oils. H. G. Smith. (*Proceedings Royal Soc. New South Wales*, through *Schimmel's Report*, May 1901, 33.) From *Eucalyptus aggregata* a yield of 0·04 per cent. of oil was obtained, having the sp. gr. 0·856. This oil contained the amyl ester of eudesmic acid, a body which has not been previously isolated. When liberated from the product of saponification eudesmic acid was obtained in the form of rhomboid crystals, which melt at 160° C. The formula $C_{13}H_{17}COOH$ is attributed to it, that of the amyl ester being therefore $C_{13}H_{17}COOC_5H_{11}$. This ester is probably a constituent of other eucalyptus oils since Bouchardat and Oliviero found amyl alcohol in the oil of *E. globulus* in 1893. *E. patentinervis* gave an oil containing a small amount of citral.

Eucalyptus Oils, Some New. (*Schimmel's Report*, Oct. 1900, 32.) *Eucalyptus bicolor* has yielded an oil having a sp. gr. 0·8866 and the opt. rot. +21° 5′. It contains much phellandrene and but little cineol.

Eucalyptus sp., "Red Gum of Tenterden," botanical source undetermined, gave an oil having the sp. gr. 0·9144 and an opt. rot. 2° 38′. It contains cineol but no phellandrene.

Eucalyptus oreades gave R. T. Baker (*Proc. Linnean Soc. New South Wales*) 1·16 per cent. of a pale yellow oil having the sp. gr. 0·8869 and the rotation −25·6°. It contains much phellandrene but no cineol; eudesmol is present in the higher boiling portion.

Eucalyptus maculosa yielded the same author 1·06 per cent. of oil having the sp. gr. 0·9075 and the opt. rot. +3·31. It contained 45·5 per cent. of cineol, no phellandrene, but some dextropinene.

Eucalyptus oils, Geraniol in. A eucalyptus oil containing 60 per cent. of geranyl acetate is reported upon by H. G. Smith (*Chem. News*, lxxxiii. 5.) It is the oil of *Eucalyptus macarthuri*, known in Sydney as "Paddy's River Box." It contains also free geraniol 10·64 per cent. but no eucalyptol or phellandrene. There is some eudesmol present, which body does not exist in the otherwise similar oil of *Darwinia fascicularis*. The geraniol is obtained in a particularly pure state from the acetate, by cold saponification with alcoholic potash. It is isolated by means of its calcium chloride compound. The original oil has a gravity at 15° C. of 0·9245; is soluble in 2 volumes of alcohol 70 per cent.; and has a rotation of +3·6° in a 100 mm. tube.

Eucalyptus Melliodora, Oil of. E. J. Parry. (*Chem. and Drugg.*, lviii. 588.) Messrs. Baker and Smith have given some figures for an oil of eucalyptus, which they state is the product of *E. melliodora*. They say that the crude oil has a sp. gr. of 0·905, and the rectified oil of 0·902, the latter containing 58 per cent. of eucalyptol. So high a percentage of eucalyptol with so low a sp. gr. has, as far as is known, never been noted by any other observer. The author has, through the courtesy of Mr. A. E. Collins, received a sample of eucalyptus oil distilled at his own works, and which was distilled from the leaves of *E. melliodora*; this had entirely different characters to those ascribed to the oil by Baker and Smith. It had a sp. gr. of 0·917, optical rotation, $-0° 37'$, and contained 52 per cent. of eucalyptol. Baker and Smith agree that the sp. gr. of this oil rises as winter sets in, but claim that the percentage of eucalyptol is practically independent of the sp. gr. No explanation, however, is offered of the statement that "the sp. gr. of a good eucalyptus oil is not governed by the amount of eucalyptol present."

Formaldehyde, Detection of, by means of Phenylhydrazine Hydrochloride. Pilhastry employs (*Repertoire*, through *Union Pharm.*, xlii. 52) a 1 per cent. solution of phenylhydrazine hydrochloride with 1·5 per cent. of sodium acetate as a reagent for the detection of formaldehyde. 3 Cgm. of the solution to be tested is treated with 5 drops of this reagent and 5 drops of sulphuric acid; in the presence of formaldehyde a green colour is produced in a few minutes; in three minutes it is evident with a dilution containing 1 : 250,000 of formaldehyde.

Furfuraldehyde, determination of. W. Cormack. (*Journ. Chem. Soc.*, lxxvii. 990.) A volumetric method for the estimation of furfural is based on the reduction of ammoniacal silver oxide solution according to the equation $C_5H_4O_2 + Ag_2O = C_5H_5O_3 + Ag_2$. A standard solution of ammoniacal silver oxide is prepared by precipitating a known weight of silver nitrate with caustic soda, washing the precipitate, and dissolving it in a minimum quantity of ammonia. It is then standardized by Volhardt's method against N/10 ammonium thiocyanate and reduced to N/10 strength. The solution containing furfural is heated for a few minutes up to 70° C., with a known volume of the standard silver solution, the precipitated metal removed by filtration through asbestos, and the unreduced silver titrated, in the usual manner, with thiocyanate solution.

Galanga root, Constituents of. Jahns (*Chem. Centr.*, lxxi. 26) has isolated galangin, $C_{15}H_{10}O_5$, camphoride, $C_{16}H_{12}O_6$, and alpinin, $C_{17}H_{12}O_6$. Testoni finds that the latter is a mixture of galangin and camphoride. He states that another constituent is the monomethyl ester of galangin, $C_{16}H_{12}O_5$.

Galangal Oil. (*Pharm. Zeit.*, xlvi. 58; and *Pharm. Zeit. für Russ.*, xxxix. 378.) Haensel gives the following characters for galangal oil: sp. gr. 0·9135; rotation at 20° C. −4·04; refraction index, 1·4782; refractometer number (Zeiss-Woolny) at 20° C., 79·9; solubility in alcohol (80 per cent.), 1:6·1; in 90 per cent. 1:0·22. P. K. Hotst finds that the oil contains 25 per cent. of eugenol. The presence of cineol has been previously recorded.

Gentian Root, Constituents of. E. Bourquelot and H. Hérissey. (*Comptes rend.*, cxxxi. 13.) By extracting freshly sliced gentian root, by boiling under a reflux condenser with alcohol, pressing, filtering, and distilling off the solvent, neutralising the acid residue with calcium carbonate, and further evaporating to a syrup, gentiopicrin, the bitter glucoside of gentian root is obtained in the form of a mass of crystals, which is purified by re-solution in a mixture of chloroform and alcohol, and crystallising out under a layer of ether. This is done by placing the chloroform-alcoholic solution in a flask with a double bottom, or diaphragm, and adding the ether cautiously by means of a pipette, so as not to mix the two liquids; as diffusion takes place, the crystals of gentiopicrin form at the juncture of the two liquids. Gentiopicrin does not reduce Fehling's solution before hydrolysis. Its solutions are strongly lævogyre $\alpha_D = -196°$. From the mother liquors (*Comptes rend.*, cxxxi. 750), by systematic treatment with alcohol, the same authors have isolated two sugars, one of which is new and has been named gentianose, the other is sucrose. Further investigation has shown (*Comptes rend.*, cxxxii. 571), that gentianose is a hexotriose, having the formula $C_{18}H_{32}O_{16}$; when treated with invertin or dilute acid it is hydrolised into a new sugar, gentiobiose, $C_{12}H_{22}O_{11}$, and levulose, according to the equation $C_{18}H_{32}O_{16} + H_2O = C_{12}H_{22}O_{11} + C_6H_{12}O_6$. When submitted to the action of the ferment of *Aspergillus niger*, or heated with a stronger sulphuric acid solution (3:1000) at 110° C., complete hydrolysis is effected, one more molecule of water being combined, dextrose and levulose resulting, as shown by the equation $C_{18}H_{32}O_{16} + 2H_2O = 2(C_6H_{12}O_6) + C_6H_{12}O_6$.

Geranium Oil, formation and constitution of, in various stages of the growth of the Plant. E. Charabot. (*Comptes rend.*, cxxxi. 806.) Comparison of two specimens of oil distilled at different periods from

plants growing in the same field shows that the proportion of esters increases as the plants develop. The total alcohol also increases, but the free alcohols show a slight diminution. The amount of the ketone, menthone, showed no great difference in these two specimens which were gathered in July and August, but a third portion distilled from the same crop in September, when the plants were fully mature, showed a material increase in that body. It is noted that this increase of menthone takes place when the respiratory activity of the plant is at its height, precisely as is found to be the case with the menthone of the peppermint oil. The intimate relationship of menthone to menthol is well established, but the connection between menthone and geraniol or rhodinol is not so apparent. It is probably derived from the rhodinol by oxidation in the green parts of the plant, being first converted into rhodinal and then into its isomer, lævo-menthone. It is noted that as this progresses the ratio of rhodinol to geraniol gradually increases, the former being formed from the latter by the addition of two hydrogen atoms. It is thus evident that two or more important chemical changes in the constitution of the oil progress simultaneously as the plant develops, and attain the maximum at the period of the greatest activity in the plant's life.

Ginger Oil, a new constituent of. H. von Soden and J. Rojahn. (*Pharm. Zeit.*, xlv. 414.) A new light sesquiterpene, zingiberene, $C_{15}H_{24}$, has been obtained by the fractional distillation of saponified ginger oil. It has the opt. rot. −63°, sp. gr. 0·872 at 15, and boils at 269–270°C.

Glycerin, Determination of Ash of. C. Ferrier (*Moniteur Scientif* [4], xiv. 808), in view of the difficulty generally experienced in perfectly ashing glycerin, and the discordant results therefore obtained in consequence of the high temperature employed, conducts the process as follows: Ten Cgm. of the sample is evaporated in a platinum capsule, taking care to avoid loss by spurting, and then burnt off until only a carbonaceous cinder is left; after roughly crushing the spongy mass which is left after combustion, 5 or 6 c.c. of distilled water is poured into the crucible, and allowed to digest for a few moments; then the clear solution is drawn off by means of a pipette with a capillary point, which does not allow the fragments of the carbonaceous residue to pass. Such a pipette is easily constructed by drawing out a glass tube in the blowpipe, and cutting off the end at the proper point to obtain a small opening. A second washing is then made in such a manner

as not to use more than 10 or 12 c.c. of water altogether; this solution is retained.

The contents of the crucible are then dried and calcined at the temperature necessary for burning off the whole of the carbon. It must be observed that with this residue, from which all the soluble salts have been removed, the calcination is very rapid, and the disappearance of the carbon almost instantaneous.

After cooling, the wash-water is added to the calcined residue, and evaporated with the usual precautions. The crucible is then thoroughly dried, and raised to a red heat for a few seconds over a Bunsen flame. By this method constant results, exact to a ten-thousandth, have been obtained.

Gold, Determination of, and separation from Platinum and Iridium. L. Vanino and L. Seemann (*Berichte*, xxxii. 1698) separate gold from platinum or iridium by treating the solution containing the metals with hydrogen peroxide after the addition of an alkali. While other methods require several hours to effect a complete reduction, in this case the gold is precipitated in a few minutes, even in the cold, as a black deposit which under the action of heat agglomerates and becomes of a reddish brown colour:

$$2AuCl_3 + 3H_2O_2 + 6KOH = 2Au + 6O + 6KCl + 3H_2O.$$

In the case of dilute solutions it is best to apply heat after the precipitation, then acidulate with HCl. For the estimation of gold in commercial chloraurate of sodium it is, however, preferable to effect the reduction by means of formic aldehyde instead of peroxide of hydrogen.

The reaction of peroxide of hydrogen in alkaline solution is much more sensitive qualitatively than any other reaction of gold. With 3 Mgm. of gold per litre a pale reddish coloration, appearing blue by reflected light, is still perceptible; this would not be detected by other reagents.

Silver is also precipitated quantitatively under the same conditions, but platinum and iridium remain in solution; this affords an excellent method for separating these two metals from gold.

Graminin in Arrhenatherum Bulbosum. V. Harlay (*Journ. Pharm. Chim.* [6], xiii. 353) has isolated a new carbohydrate from the bulblets of *Arrhenatherum bulbosum*, which has many characters in common with the phlein and graminin obtained by Eksland and Johanson from *Trisetum alpestre* and *Phleum pratense*. The

crushed bulbils were macerated for 24 hours in the cold with a thymolised 5 per cent. solution of neutral lead acetate. After pressing and filtering, excess of lead was removed with oxalic acid, the filtrate treated with calcium carbonate, and the carbohydrate precipitated with 90 per cent. alcohol after filtration. The aggregated mass was then dried in vacuo over H_2SO_4 powdered, washed with alcohol, and again dried. It forms a white powder, soluble in water; the solution does not reduce Fehling's reagent, but reduces ammoniacal silver nitrate; it does not precipitate with lime water, nor with basic lead acetate, but gives a precipitate with baryta water. It melts with puffing and darkening at 212° C. Its rotation is $\alpha_D = -44° 72'$. It is only slowly and slightly hydrolised when heated under pressure in neutral solution, but in the presence of a trace of H_2SO_4 under the same conditions it is hydrolised, yielding levulose. Saliva and diastase are without action on it; the juice of the green shoots of the plant, although they contain an amylase which hydrolyses starch, does not act upon graminin, but the white etiolated subterranean shoots yield a juice which causes a marked hydrolysis of the carbohydrate; the ferment of *Aspergillus* also attacks it. In addition to graminin 7·47 per cent., the fresh tubercles contain 1·6 of reducing sugars, of which 0·64 is glucose and 0·95 levulose.

Gutta Percha, Analysis of. C. Hugo Borntraeger (*Annales de Chim. Analyt.*, vi. 71) states that the average composition of commercial gutta percha consists of from 1 to 1·5 per cent. of moisture, from 3 to 5 per cent. of foreign matter, from 30·5 to 83·5 per cent. pure gutta, $C_{10}H_{16}$, from 7 to 44 per cent. of albane, $C_{10}H_{16}O$, and from 3 to 21 per cent. of fluavil, $C_{40}H_{64}O_3$. *Water* is determined by drying in a current of air at 100° C. *Foreign matter:* 1 Gm. of crude gutta is dissolved on the water-bath under a reflux condenser in 50 c.c. of benzol: the insoluble matter is collected on a tared filter washed with more benzol, and after drying at 110° C. weighed as foreign impurities. *Pure Gutta:* The bulked filtrates from the previous experiment are evaporated to 50 c.c. Absolute alcohol 200 c.c. is then added, and the mixture allowed to remain for 2 hours on the water-bath (under a reflux condenser). Pure gutta is precipitated. It is collected, dried at 100° C., and weighed. *Fluavil and albane:* In practice the amount of fluavil and albane are determined by difference. If exact determinations are required, the solution from which the gutta has been precipitated is evaporated to 50 c.c., then mixed with absolute alcohol 100 c.c. in a tared dish,

the supernatant liquid is then decanted, the residue washed with alcohol, dried at a temperature not exceeding 80° C., and weighed as albane. If the component constituents of this albane are required a larger portion of the original substance must be treated and the separated albane submitted to fractional distillation. It is then separable into three fractions: (A1) distilling at about 200° C. as a yellowish oil; (A2) boiling at 250° C., a deep yellow oil; and (A3) a non-volatile resin. A typical crude gutta percha gave the following percentages: Water 1·5, foreign impurities 2·5, pure gutta 77·5, fluavil 6·0, albane (A1) 3·8, albane (A2) 3·7, albane (A3) 5·0.

Hydrocinchonine and Cinchonine. E. Jungfleisch and E. Léger. (*Journ. Pharm. Chim.* [6], xiii. 323.) The authors now find the base previously obtained by them by the action of dilute sulphuric acid on cinchonine, and named cinchonifine, to be identical with hydrochinonine. Both bases have the same melting point, 278° C., and the rotation $\alpha_D = + 199°$. Commercial samples of cinchonine sulphate (*Comptes rend.*, cxxxii. 828) are found invariably to contain considerable quantities of hydrocinchonine. By fractional crystallisation both from water and from alcohol cinchonine containing only a trace (less than one per cent.) of hydrocinchonine was obtained. This was found to have the solubility in water of 1 : 72·1 at 12° C. The melting point of the base is 264·3° C.; its optical rotation in alcoholic solution is $\alpha_D = + 229·6°$, which differ materially from those previously recorded for cinchonine.

Hyoscyamus Muticus; Egyptian. W. R. Dunstan and H. Brown. (*Proc. Chem. Soc.*, xvi. 207.) The authors confirm the statement of Gadamer that Egyptian *Hyoscyamus muticus* is much richer in hyoscyamine than the same plant previously reported on by them which, grown in India, only yielded 0·1 per cent. of that alkaloid. Egyptian plants recently examined gave from the seeds 0·87 per cent. and from the leaves 0·59 per cent. of hyoscyamine. The plant is abundant and would furnish a suitable source for the preparation of the alkaloid on the commercial scale.

Hurin. J. J. Surie. (*Nederl. Tijdsch von Pharm.*, through *Pharm. Zeit.*, xlv. 468.) By treating the milky juice of *Hura crepitans* with ether, purifying the ethereal extract with alcohol and lead hydrate, a volatile acrid body was obtained, which appears to be related to the vesicent acid of croton oil. Although it is vola-

tile, hurin cannot be isolated by distillation, since it is decomposed by heat.

Hydrogen Peroxide, Alkaline Persulphates and Percarbonates; Iodometric Determination of. E. Rupp. (*Archiv der Pharm.*, ccxxxviii. 156.) Hydrogen peroxide may be accurately determined by means of its action of liberating iodine from alkaline iodides. 1 c.c. of the sample is mixed with 20 c.c. of water, 5 c.c. of dilute sulphuric acid added on the 1 Gm. of potassium iodide. After standing for 30 minutes in a closed flask, the liberated iodine is titrated in the usual manner with N/10 thiosulphate solution. Persulphates and percarbonates may be determined in a similar manner, but the length of time allowed for the liberation of the iodine before titration should be extended to 2 hours.

Indican; Detection of, in Urine. A. Klett. (*Schwerz. Woch. für Pharm.*, xxxix. 31.) 10 c.c. of urine is treated with 5 c.c. of hydrochloric acid 25 per cent. and a few drops of ammonia persulphate solution; a little chloroform is then added to the mixture, which is shaken up. On allowing to separate, the chloroform acquires a blue colour if indican be present.

Inula Helenium; Constituents of. D. Julius Sprinz. (*Archiv der Pharm.*, ccxxxix. 201.) Kallen has shown that the so called helinin of Dumas and Gerhard, obtained by extraction of the root with alcohol, or by steam distillation, consists of three chemically distinct bodies, which he named alantol, alantic anhydride and helinin; to the last the formula (C_6H_8O) was attributed. Sprinz finds that the formula is $C_{15}H_{20}O_2$ and that it is an isomer of alanto-lactone; he therefore suggests that the helenin of Kellen should be renamed "iso-alanto-lactone." It occurs in white, stable crystalline prisms, melting at 115° C. By heating for 5 or 6 hours with alkali, the lactone ring is broken up, and the alkaline salt of iso-alantolic acid is formed. This, when liberated with acid, has the formula $C_{14}H_{20}(OH)COOH$. It occurs in white crystalline needles which are soluble in alcohol, from which solution it is thrown out on the addition of water. When boiled with water, it is reconverted into the lactone, a transformation which takes place immediately on the addition of a mineral acid. By dissolving iso-alanto-lactone in absolute alcohol, and saturating with ammonia, isoalantolamide, $C_{14}H_{20}(OH)CONH_2$, is formed, which crystallises in needles melting at 237–239° C.

By acetylising this amide, acetylisoalantolamide, $C_{17}H_{25}O_3N$, is obtained, which is crystalline, and melts at 212° C. On treatment with sodium amalgam iso-alanto-lactone takes up hydrogen, forming hydro-iso-alanto-lactone, $C_{14}H_{22} < \begin{matrix} O \\ | \\ CO \end{matrix}$ from which by treatment with alkali the corresponding hydro-iso-alantolic acid, $C_{14}H_{22}(OH)COOH$, is formed. The original body forms two addition products with HCl: a mono-hydrochloride, $C_{15}H_{20}O_2HCl$, in crystalline needles melting at 153° C.; and a di-hydrochloride, $C_{15}H_{20}O_2,2HCl$.

Iodic Acid, Preparation of. A. Scott and W. Arbuckle. (*Journ. Chem. Soc.*, lxxix. 302.) The statement of Stas that the yield of iodic acid obtainable by oxidising iodine with nitric acid does not represent one fourth of the iodine employed is found to be incorrect. By treating iodine 20 Gm. in a Soxhlet extractor under a reflux condenser with fuming HNO_3, 150 c.c., all the joints of the apparatus being of glass to glass, a yield of 26 Gm. of iodic acid, or 93 per cent., was quickly obtained. The method, however, is not satisfactory, on account of the tendency of the iodic acid to crystallise in the syphon tube and so block it.

It was found preferable to employ a long-necked flask, in the neck of which a double quill U tube condenser was fitted, through which a brisk current of cold water was kept running. A current of oxygen or of air was also passed through the acid during the heating, the delivery tube for which very nearly touched the bottom of the flask, to avoid violent bumping. With this apparatus not more than 20 Gm. of iodine should be employed, or more nitric acid is necessary; a yield of 27 Gm. of iodic acid may then be obtained in 25 minutes.

Iodoform, Alcohol, Acetone and Aldehyde, Delicate test for Traces of. R. Van Melcketeke. (*Repert.* [3], xiii. 176.) 250 c.c. of the liquid to be examined is distilled, and the first 25 or 30 c.c. collected. This, acidified with acetic acid, is treated with zinc or aluminium dust, gently warmed to start action, then left in the cold for some hours, finally boiled and filtered. A few drops of starch solution and of dilute sulphuric acid are then added, and lastly one or two drops of a 1 per cent. solution of sodium or potassium nitrite are allowed to run down the sides of the tube. In the presence of iodoform the characteristic iodine reaction will be obtained. If very feeble, or not evident, on shaking with 1 c.c. of

chloroform the rose or violet colour of iodine will be obtained in the solvent. This test will detect 1 in 500,000.

To detect traces of alcohol, aldehyde, or acetone, the liquid is distilled as above, a few drops of iodine solution in potassium iodide are added to the distillate, the free iodine removed by soda, and the liquid again distilled; the distillate is then tested for iodoform as described above.

Iron Nitride. G. J. Fowler. (*Journ. Chem. Soc.*, lxxix. 285.) Iron nitride, Fe_2N, was obtained by the action of ammonia on ferrous chloride or bromide, on finely divided iron, or on iron amalgam. By the first process, at low temperatures, pure ferrous chloride rapidly absorbs 6 molecules of ammonia, forming a voluminous white mass which gives off ammonia at 100° C. On further heating to about 600° C., reduction of the ferrous chloride takes place with the formation of ammonium chloride, iron nitride and nitrogen. No hydrazine compounds or other intermediate products are formed. It was not possible to obtain the nitride in quantity, by this method, free from intermixed ferrous and ammonium chloride or bromide.

By the direct action of ammonia on reduced iron, to which the ammonia is admitted as soon as reduction is completed by means of hydrogen, avoiding all contact with air, the best results were obtained. The reaction proceeds best at a temperature of 414° C. The iron amalgam method was found to have no advantages over the employment of reduced iron as described above. Iron nitride is a grey powder, rather duller than reduced iron. Although not attracted by the magnet, a moderately strong electro-magnet readily attracts it. It has the sp. gr. of about 6·25. It begins to oxidise at about 200° C. In chlorine it takes fire on slightly warming, Fe_2Cl_6 and nitrogen being formed, but no nitrogen chloride. Iodine in ethereal solution is without action on it, dilute HCl and H_2SO_4 dissolve it, forming ferrous and ammonium salts and liberating hydrogen. Nitric acid attacks it but slowly. Gaseous HCl only begins to attack it at 220° C., the reaction becoming rapid at 350° C. Pure carbon is without action, but in the presence of sodium, sodium cyanide is formed.

Iron Selenides. Fonzes Diaçon. (*Comptes rend.*, cxxx. 1708.) By the action of selenium or of selenuretted hydrogen on iron oxides or salts, five selenides have been obtained: FeSe, $FeSe_2$, Fe_2Se_3, Fe_3Se_4, and Fe_7Se_8. FeSe is obtained by the action of the

vapour of Se, or of H_2Se, diluted with nitrogen, on metallic iron heated to redness. The resulting mixture of FeSe and metallic selenium is then heated in a current of hydrogen, which removes the metal without affecting the ferrous selenide. $FeSe_2$ is obtained by treating $FeCl_2$ heated to redness with a current of H_2Se diluted with nitrogen. Fe_2Se_3 results from the action of H_2Se on Fe_2O_3 heated to redness. At a white heat Fe_2O_3 or Fe_2Cl_6 give Fe_3Se_4, and at a higher temperature Fe_7Se_8. The subselenide Fe_2Se has not been obtained.

Isomeric Alcohols, Colour tests for. A. C. Chapman. (*Analyst*, xxv. 313.) Eugenol and iso-eugenol, safrol and iso-safrol, estragol and anethol may be differentiated by their respective colour reactions in the following manner: One c.c. of the substance is dissolved in 5 c.c. of acetic anhydride; a fragment of (*a*) fused zinc chloride or (*b*) one drop of sulphuric acid is added. With the sulphuric acid test *eugenol* gives first a brown, then a purple colour, finally a wine red tint. *Iso-eugenol* gives first a rose pink, then a light brown. *Safrol* gives a bright emerald green, finally becoming brown; *iso-safrol* a rose pink turning to light brown. *Estragol* gives a purple colour, passing from indo-blue to bluish purple; while *anethol* gives no colour at first, ultimately becoming yellowish. With zinc chloride *eugenol* is pale yellow; *iso-eugenol* bright rose pink; *safrol*, pale blue passing to light brown; *iso-safrol*, pink gradually changing to brown; *estragol* blue violet, becoming brownish, and *anethol* pale yellow, slowly deepening to brick red.

Jasmin, Volatile Oil of. (*Berichte*, xxxii. 365, 765, 2611; xxxiii. 1585; xxxiv. 291.) Hesse and Mueller find that the volatile oil of jasmin extracted from pomades produced by the *enfleurage* method has the following percentage composition: benzyl-acetate 65, linalyl acetate 7, benzyl-alcohol 6, linalool 16, indol 2·5, methyl anthranilate 0·5, and jasmone 3. Jasmone is a new ketone, having the formula $C_{11}H_{16}O$. They were unable to confirm the statement of Verley as to the presence of jasmal, which that author identified as phenyl-glycol-methacetaldehyde. Hesse finds that the oil of jasmin, extracted from the flowers by a volatile solvent, differs from the oil of *enfleurage* process, in containing no indol and no methyl anthranilate. He controverts the statement of Jeancard and Satie (*Bull. Soc. Chim.* [3], xxxiii. 555) that the difference is due to the fact that the benzoated lard employed for extraction, being first washed with rose or orange flower water, owes some of these constituents to that source, by showing that they are present

in enfleurage-prepared oil, made with lard which has not been so treated. He concludes that the *enfleurage* method is at present the most satisfactory for the preparation of jasmin oil for perfumery purposes, since the method of extraction by volatile solvents gives a much poorer yield of odoriferous principles than the older process. Indol, which is an important constituent of jasmin oil, is readily isolated by warming the oil with an aqueous solution of picric acid; on cooling crystals of indol picrate separate out. Indol forms with bisulphite a compound which separates in fine silky scales, the formation of which has led to the erroneous conclusion that jasmin oil contains an aldehydic body.

Kampferia Oil. P. Van Romburgh. (*Schimmel's Report*, Oct. 1900, 38.) The author finds that the oil distilled from the rhizomes of *Kampferia galanga* contains the ethylic ester of para-methoxycinnamic acid, $C_6H_4(OCH_3)CH{:}CHCOOC_2H_5$ (1·4), which has not been previously recorded as a constituent of a volatile oil. It separates out as a heavy liquid during distillation, which solidifies to a crystalline mass. A portion of the oil, probably a sesquiterpene, is lighter than water, and floats on the aqueous distillate.

Kauri Copal, Constituents of. A. Tschirch and B. Niederstadt. (*Archiv der Pharm.*, ccxxxix. 145.) The resin of *Dammara australis* has the following percentage composition. From 73 to 75 per cent. of the total resin is soluble in soda solution. This portion comprises kaurinic acid, $C_{10}H_{16}O_2$, 1·5 per cent., which is removed from ether by ammonium carbonate solution; α- and β-kaurolic acids, $C_{12}H_{20}O_2$, from 48 to 50 per cent., soluble in sodium carbonate solution; kaurinolic acid, $C_{17}H_{34}O_2$, and kauronolic acid, $C_{12}H_{24}O_2$, together from 20 to 22 per cent., both soluble in potassium hydrate solution. All these are amorphous except kaurinic acid, which gives crystalline salts; α- and β- kaurolic acids are separated by means of the differing solubilities of their lead salts in alcohol, that of the α- acid being insoluble, while lead β-kaurolate is soluble. When regenerated from this combination α-kaurolic acid melts at 75° C. and β-kaurolic acid at 78° C. The portion of the resin insoluble in soda solution, comprising 24 to 25 per cent. of the whole, consists of volatile oil 12·5 per cent., having a pleasant balm or lemon-like odour and the sp. gr. 0·853 at 15° C. The greater part distils between 156° and 160° C. It is neutral when first distilled, but acquires an acid reaction on keeping, and resinifies when exposed to the air. The

other soda insoluble constituents are resene 12·2 per cent., and about 0·5 per cent. of a bitter principle.

Larch Turpentine, Constituents of. A. Tschirch and G. Weigel. (*Archiv der Pharm.*, cxxxviii. 387.) The percentage composition of the oleoresin of *Larix decidua* is found to be from 60 to 64 per cent. of resin acids soluble in soda solution, from 20 to 22 per cent. of volatile oil, and from 14 to 15 per cent. of indifferent resene. The resin acids comprise laricinolic acid, $C_{20}H_{30}O_2$, which is crystalline, but only occurs in small quantity. The greater part of the acid resins is composed of the two amorphous α- and β-larinolic acids, $C_{18}H_{26}O_2$, which are separable as lead salts. The resins contain no esters. The bulk of the volatile oil boils between 155° and 176° C. A smaller portion, a sesquiterpene, commences to boil at 190° C.

Lavender Oil, Adulteration with Resin. (*Schimmel's Report*, October 1900, 41.) Specimens of lavender oil adulterated with resin have been met with. These had an abnormally high sp. gr.: 0·915 to 0·916, were thick and viscous, but the ester content and other constants were not affected. On evaporation, however, from 11·27 to 12·5 of a hard brittle residue was obtained, while pure lavender oil of similar ester content gave only 2·4 per cent. All lavender oils having a sp. gr. above 0·895 should be therefore tested by evaporation.

Lavender Oil, Presence of Coumarin in. (*Schimmel's Report*, October 1900, 40.) Coumarin has been found to be a normal constituent of the higher boiling portion of lavender oil. That it is a natural constituent and has not been added with a view to modifying the odour of the oil, is proved by the fact that it is also found in the distillate from dry lavender flowers. From these the whole of the coumarin passes over during distillation, the residual flowers yielding only o-cumaric acid to extraction by ether.

Lead Acetate, Basic, Test Solution of. H. Cortonne (*L'Union Pharm.*, xli. 487.) A reagent of definite composition. may be prepared as follows. Lead acetate 350 Gm. is dissolved in distilled water 825 Gm., and to the liquid, solution of ammonia (sp. gr. 0·892) 55 c.c. is added. The presence of ammonium acetate does not interfere with the application of the reagent to the usual purposes required in analytical work.

Lemon Oil: Last Year's Product. (*Schimmel's Report*, May 1901, 28.) The lemon oil at present obtainable, the product of last year's harvest, is distinguished by an abnormally low sp. gr. and a high rotation, only the products of a few districts attaining the

minimum sp. gr. of 0·858. In a summary of the results of an examination of oils from twenty-nine districts the lowest sp. gr. observed was only 0·8536, the highest 0·8588; the lowest recorded optical rotation was +57° 54′, the highest +66° 2′. In some districts the yield of oil was exceptionally high, and it was in these that the abnormal figures were most pronounced.

Lemon, Bergamot, and Orange Oils, Characters and Tests for. A. Soldaini and E. Berté (*L'Orosi*, xxxii. fasc. 9, through *Monit. Scient.* [4], xv. 180) suggest the following limits for the physical and chemical characters of the three chief aurantiaceous oils.

Lemon Oil. *Sp. gr.* at 15° C. 0·854 to 0·860. *Optical rotation* not below +56° at 20° C. nor above +66°. A lower rotation than +56° may occur with unmixed oils which have deteriorated by keeping, or in oils derived from unripe fruits which have been stored in cases. The *citral content* should not fall below 6·5 c.c. from 100 Gm. of essence, except in the case of certain abnormal crops or of oil produced in certain districts. The authors thus modify the method generally adopted for the determination of citral. They use saturated solution of potassium bisulphite instead of sodium bisulphite. Exactly 5 c.c. of the oil is measured off in a graduated pipette, and is run into a small 100 c.c. distilling flask, the neck of which has the same diameter as the pipette. It has also a side tube, which is bent upwards at right angles and is closed by a rubber tube fitted with a pinch-cock; 25 c.c. of saturated potassium bisulphite solution are then added and the whole is shaken to form an emulsion. The pipette used to measure the oil is reversed and attached to the end of the neck of the flask. The mixture is then warmed on the boiling water-bath for ten minutes, with constant agitation, cooled, again warmed for five minutes, and finally cooled. A small funnel is now attached to the end of the side tube, and water introduced into the flask so as to bring the oily layer into the graduated portion of the pipette, when its volume may be determined. If a certain quantity of turpentine oil be present, the aqueous liquid remains more or less opalescent for twelve hours. When both orange oil and turpentine are present the bisulphite solution causes a more or less bulky orange yellow precipitate. *Fractional Distillation.* The first 10 c.c. distilled off from 20 c.c. under reduced pressure (10–20 mm.) should not have a rotation lower than that of the original oil. *Boiling Point* should be 171°–172° C. at 30 to 40 mm. pressure. *Detection of orange oil.* One drop of the oil treated

with 15 to 20 drops of bromine-chloroform should not give a yellow colour. Sodium bisulphite should produce only a white crystalline precipitate and not a yellow one.

BERGAMOT OIL. *Sp. gr.* at 15° C. 0·882 to 0·886 (ordinarily 0·881 to 0·885). *Optical rotation* between +8° and +20° (usually between +12° and +18°). *Lynalyl acetate content* not below 34 per cent. unless in the case of an abnormal crop, or of oil derived from immature fruits. The usual figures for the normal oil are 35 to 42 per cent. *Fractional Distillation.* The first 5 c.c. distilled from 15 c.c. under reduced pressure, 20-30 mm. should have a rotation two-and-half times greater than that of the original oil; the next 9·5 c.c. should be inactive or almost so. The boiling point at the commencement of the distillation of the oil at this pressure is 69° C. *Fixed residue* should not be lower than 5 nor more than 6 per cent. *Solubility in alcohol* 90 *per cent.* Two volumes of oil should give a clear liquid with one volume of alcohol, and should not become turbid on further addition of alcohol. Insoluble nonsaponifiable bodies should be entirely absent. Schiff's reagent should give with the oil at the most only a trace of colour in half an hour. The rapid formation of the colour, which attains its maximum in a quarter of an hour, indicates the presence of lemon oil. In this case the presence of aldehyde may be confirmed in the second portion distilled in the fractionation test.

ORANGE OIL. *Sp. gr.* at 15° C. between 0·847 and 0·853. *Optical rotation* at 20° between +96° and +98°. The optical rotation of the distillate is always 1°, frequently 2° or 3° higher than that of the original oil. The distillate should not affect Schiff's reagent.

Lignaloe Oil, Cayenne. (*Rev. gen. de Chim.* through *Schimmel's Report*, May, 1901, 40.) E. Theulier has distilled the oil of "Bois de Rose femelle," concerning which the following data are given. Yield 1·4 to 1·6 per cent. Sp. gr. at 14·5° C. 0·8725 to 0·875. Solubility in alcohol (70 per cent.) 1 : 2. Saponification number 1·385. The bulk of the oil consisted of lævolinalool, which is the so-called licareol of Morin. It contains no methyl-heptenone, no geraniol, and no terpineol, all of which are constituents of Mexican lignaloe oil.

Lignaloe Oil, Mexican. (*Schimmel's Report*, October, 1900, 43.) The presence of geraniol and dextro-terpineol in Mexican lignaloe oil is established. The alcohols of this oil consist approximately of lævo-linalool 90·0 per cent., dextroterpineol 6·5 per cent., and geraniol 3·5 per cent.

Limonenol. P. Genvresse (*Comptes rend.*, cxxxii. 414) has synthetized a new alcohol from limonene which he calls limonenol, $C_{10}H_{16}O$, by passing the vapour of nitric peroxide into limonene, rise of temperature being prevented by surrounding the containing vessel with a freezing mixture. It is a colourless fragrant liquid, having the sp. gr. 0·9669 at 15° C. and boiling at 135° C. at 15 mm. pressure. It was isolated by means of its solubility in saturated solution of sodium salicylate, when treated by the method of Duyk (Year Book, 1900, 63). It is a secondary alcohol and gives a ketone, limonenone, $C_{10}H_{14}O$, on dehydration. This, when treated with hydroxylamine hydrochloride, yields limonenoxime, $C_{10}H_{16}NOH$, which differs from the carvoxime of Wallach only in its melting point.

Linseed Oil: The Pharmacopeial Tests for. C. R. C. Tichborne. (*Pharm. Journ.* [4], xi. 573.) The statement in the official work that linseed oil is soluble in 10 parts of alcohol 90 per cent. is incorrect. A specimen of oil expressed by the author was found to be quite insoluble in that solvent, as were the commercial specimens of reputed pure oil examined by him. The characters and tests of the oil should be modified as follows: sp. gr., 0·930 to 0·935. It is practically insoluble in alcohol (90 per cent.) at ordinary temperatures. It is miscible with oil of turpentine in all proportions, giving a bright solution.

Fifty grammes being weighed in a glass beaker, and 10 c.c. of sulphuric acid gradually added (so that about sixty seconds is taken in its delivery), the mixture also being kept stirred by a thermometer immersed in it; the rise of temperature observed in this experiment should not be less than 114° C.

Magnesium Oxide, Heavy. F. H. Alcock. (*Pharm. Journ.* [4], xii. 461.) On heating 1 Gm. of the oxide from different sources it was found that the loss was variable, six samples losing respectively 0·055 Gm., 0·065 Gm., 0·047 Gm., 0·053 Gm., 0·074 Gm., 0·061 Gm. A quantity taken from a large stock bottle, from the top lost 0·066 Gm., and from the bottom 0·052 Gm. This substance therefore requires careful storage, and, before removal from bottle, brisk agitation.

Mandragora Root, Alkaloids of. M. Wenzel and H. Thoms. (*Berichte*, xxxiv. 1023.) The authors have already shown that Ahren's "mandragorine" is simply a mixture of alkaloids in which hyoscyamine, $C_{17}H_{23}O_3N$., is the chief constituent. The other alkaloids are obtained by exhausting the disintegrated root with a solution of tartaric acid in alcohol and water,

evaporating the extract *in vacuo*, and shaking out, first with petroleum ether, and then with ether. The latter takes up the β-methyl-æsculetin (Kunz-Krause's chysatropic acid). The mixture of bases is then exactly neutralized with mineral acid, decomposed with sodium carbonate and extracted with ether. After twice repeating this treatment the weaker base, scopolamine, $C_{17}H_{21}O_4N$, is separated from the more strongly basic hyoscyamine. Hyoscine could not be found among the mandragora alkaloids, but a third base belonging to the piperidine series was detected, upon which a further communication will be made.

Manganese, Detection and Determination of Minute Quantities of. Hugh Marshall (*Chem. News*, lxxxii. 76.) detects manganese in traces by gently warming a solution of the substance to be tested in dilute sulphuric or nitric acid, with ammonium or potassium persulphate, with the addition of a drop of dilute silver nitrate solution. The reaction is sufficiently delicate to detect the presence of 0·001 Mgm. of manganese. About 1 gramme of the substance is dissolved in dilute HNO_3 a pinch of ammonium or potassium persulphate is added, with a drop of H_2SO_4 and a drop of a dilute solution of $AgNO_3$; the mixture is allowed to stand for a while at a moderate temperature, when the characteristic pink colour will be developed. If the manganese is present in the manganic condition, it should be first reduced by means of a few drops of sulphurous acid. If chlorides be present, sufficient of the silver solution should be added to precipitate these, and to leave a slight trace in excess. The test may be employed colorimetrically by comparing the depth of tint with dilutions of known quantities of standard permanganate solution, which should be reduced with sulphurous acid and then oxidised with ammonium persulphate and silver nitrate, under the same conditions as the test.

Melissa Calamintha, Volatile Oil of. (*Schimmel's Report*, May, 1901, 59.) The fragrant nature of this oil, which has not previously been distilled, will probably render it of commercial value. It has the sp. gr. 0·8759, optical rotation $-28° 12'$ at 16° C., refraction index 1·49507, and saponification number of 4·5. It is not entirely soluble in alcohol (90 per cent.).

Mercuric Iodides, Crystalline. F. Bodroux. (*Comptes rend.*, cxxx. 1622.) Mercuric iodide is obtained in fine red transparent crystals 1 cm. long by the gradual decomposition of methyl or ethyl iodide and an aqueous solution of a mercuric salt. Two

hundred Gm. of mercuric acetate solution, 5 per cent., was shaken with 5 Gm. of methyl iodide and the mixture set aside; in 20 minutes small yellow crystals appear, and in 12 hours a fine crop of red crystals is formed. Mercurous iodide is obtained as golden yellow spangles by treating mercurous nitrate solution in the same way. As soon as well formed crystals appear, the formation may be hastened by agitation, but not until then, or the iodide will be thrown down in the amorphous condition.

Mercury, Determination of, in Ammoniated Mercury, and other Mercury Compounds. C. T. Bennett. (*Pharm. Journ.* [4], xi. 575.) The mercury salt is dissolved in water or in hydrochloric acid, to which a few drops of nitric acid have been added, and then reduced with excess of hypophosphorous acid. The metallic mercury is then collected into a globule, dried and weighed. In the case of ammoniated mercury, the official requirement that it should contain from 78 to 79 per cent. of Hg is considered to be slightly too high. The highest commercial specimen examined contained 77·2 per cent. It is well known that prolonged washing converts the white precipitate into a yellowish compound, consequently commercial samples are frequently not thoroughly washed, and traces of ammonium salts are present. *Pilula hydrargyri* mass may be assayed by this method, destroying the organic matter and dissolving the mercury by means of nitric acid, and then reducing the mercuric nitrate by means of hypophosphorous acid.

Mercury, Determination of, in Mercuric Salicylate. F. Rupp (*Archiv*, ccxxxix. 114) criticises the method for determining the mercury in the official (Ph. 6, IV.), process for mercury salicylate, and suggests as an alternative the following: Thirty Cgm. of the salt is rubbed down with a little water and treated with twenty-five c.c. of N/10 iodine solution in a stoppered flask and allowed to stand for one hour. The excess of uncombined iodine is then titrated with N/10 thiosulphate solution. From the figures thus obtained the amount of Hg present is calculated. The results are invariably a trifle low, due, in the author's opinion, to the formation of a soluble mercury compound in the process of preparing the salt.

Meta-cresol, Determination, in Commercial Cresols. F. Rashig. (*Zeits. für Angewandte Chem.* through *Chem. News*, lxxxiii. 77.) For

the manufacture of explosives, picric acid is now largely replaced by trinitro-meta-cresol, to produce which commercial cresol containing on an average 40 per cent. of ortho-cresol, 35 per cent. of meta-cresol, and 25 per cent. of para-cresol is employed. To determine the amount of meta-cresol in this substance, the following process is recommended.

Exactly 10 Gm. of cresol are taken, and mixed in an Erlenmeyer flask with 15 c.c. of ordinary sulphuric acid at 66° B. This is left for about an hour in a steam oven. The contents of the flask is then poured into a wide necked flask of 1000 c.c. capacity, and cooled under the tap while shaking.

By this operation the sulph-acid, which is fluid when warm, is deposited in the form of a thick syrup on the sides of the flask. 90 c.c. of ordinary nitric acid at 40° B. are then poured into the Erlenmeyer flask which was used for the sulphonation, and which still contains a little of the sulph-acid. In this manner the whole of the sulph-acid is brought into solution, and the liquid is poured into the litre flask at once. This latter is immediately shaken vigorously until the whole of the sulph-acid is dissolved, an operation which only requires about twenty seconds. The flask is then placed in the fume closet, and after about a minute a violent reaction commences; the contents of the flask begin to boil violently, accompanied by an abundant disengagement of red fumes; the solution, which has till now been clear, becomes suddenly cloudy, oily drops of trinitro-cresol separate out, and collect at the bottom of the flask; at the end of five minutes the reaction appears to have finished. The flask is, however, left for another five minutes, as the reaction is not really over sooner.

The contents are then poured into a dish containing 40 c.c. of water, and the flask is rinsed with another 40 c.c. of water. On contact with the water, the oil froths up, gives off nitrous fumes, and becomes solid, forming a crystalline mass of trinitro-meta-cresol. This is allowed to cool for about two hours, when it is coarsely powdered, and collected on a filter-paper with the help of a filter-pump. The filtration is effected very rapidly; the residue is washed with 100 c.c. of water, dried on the filter at 95–100° C., and weighed, placing a filter-paper of the same size on the other pan of the balance as tare.

With a little practice an estimation can be made in five hours, and ten or twenty analyses can easily be done concurrently.

Chemically pure meta-cresol treated in this manner gives exactly 17·4 Gm. of trinitro-cresol, and it has been proved by a large

number of experiments that the most variable mixtures of meta-cresol and para-cresol, and of meta-cresol and ortho-cresol, always give 1·74 per cent. of trinitro-cresol per 1 per cent. of meta-cresol. And again, by mixing 9 Gm. of meta-cresol with 1 Gm. of phenol, we obtain exactly $9 \times 1{\cdot}74 = 15{\cdot}6$ of the nitrated product.

It is probable that the picric acid derived from the phenol remains in solution under the existing conditions; but in the presence of more than 10 per cent. of phenol, the picric acid is precipitated with the trinitro-cresol, from which it follows that the process cannot be applied to mixtures very rich in phenol. Such mixtures, however, are not often met with commercially, and further, the presence of phenol can easily be ascertained by the boiling-point, as well as by the fact that the nitrated product, dried at 95–100° C., becomes deliquescent, or turns into a soft paste, instead of remaining a solid mass.

Xylenols also, which are to be found more frequent in cresol, behave in the same manner; the nitrated product becomes liquid when warmed, and is not solidified when cooled. On the other hand, a cresol which is almost entirely volatile between 190° C. and 200° C., that is to say, almost entirely free from phenols and xylenols, always gives, under the conditions described, a bright yellow crystalline mass, the weight of which divided by 1·74 represents the amount of meta-cresol present.

Methyl Alcohol in Fermented Fruit Juices. Jules Woolf (*Comptes rend.*, cxxxi. 1323) finds that methyl alcohol invariably occurs to the extent of from 2 to 0·15 per cent. by volume of the ethyl alcohol formed in the course of fermentation of fruit juices. Black currants gave the most, grapes the least. No trace of methyl alcohol was detected in any fermented grain spirits. Cheap brandies distilled from grape marc contained a considerable amount, but the better qualities of cognac were free from more than traces.

Methylene Glucose, a new Glucoside. B. Tollens (*Berichte*, xxxii. p. 2585) has succeeded in synthetising methylene glucose, $C_{10}H_6(CH_2)O_6\frac{1}{2}.H_2O$, by allowing a mixture of 500 Gm. formaldehyde and of glucose, 50 Gm. of concentrated hydrochloric acid and a like quantity of acetic acid to stand together for several months. Methylene glucose then forms crystals which are recrystallised from water; it melts at 187–189° C.; reduces Fehling's solution, but does not ferment with yeast. Its osazone, $C_{19}H_{22}N_2O_4$, is a yellow powder melting at 164°–166° C.

Milk Analysis, Determination of Fat. O. Lecompte (*Journ. Pharm. Chim.* [6], xiii. 58) rapidly dries the milk in a suitable condition for ether extraction, as follows: ten c.c. of the milk to be examined is poured on to 20 Gm. of finely powdered anhydrous sodium sulphate, in a mortar, and the mixture triturated until intimately mixed. The mixture is then exposed on a watch glass to the air, for an hour, then powdered and packed in the tube of the Soxhlet, and extracted with ether in the usual manner.

Milk Preservatives, Detection and Determination of. M. Wynter Blyth. (*Analyst*, xxvi. 149.) *Examination for preservatives.* Measure 10 c.c. of each milk into clean wide test tubes. Measure 10 c.c. of a sterile milk known to be free from preservatives into a test tube (these control tubes can be kept ready for use). Add to each milk and to the control 2 c.c. of a very strong, slightly alkaline solution of litmus. Now examine all the tubes, and if any of them are not the same shade of blue as the control tube, drop in, drop by drop, a half normal solution of sodium hydrate until the correct shade of blue is obtained. This will be found unnecessary in the case of most milks, and will only be requisite when the milks are two or three days old; this process must then be done very carefully. Plug all the tubes with cotton wool, and heat them in a water bath, kept at a temperature of 80° C. for ten minutes. Allow the tubes to cool, and inoculate each, including the control, with half a c.c. of sour milk in water (half c.c. milk to 100 c.c. water). Shake the tubes well. Now let the tubes stand for 24 hours at any temperature between 15° C. and 22° C., and then examine. If the control tube be not white, or nearly so, they must be allowed to stand for a longer period. Those tubes which contain preservatives will remain blue or pink, while the tubes which contain no preservatives will behave in the same way as the control tubes, becoming quite white. The length of time the blue or pink colour takes to become white depends upon the quantity of preservative present in the sample. The quantities of the more common preservatives which can be detected with certainty by this method, are 0·005 per cent. of borax, boracic acid, or mixtures of these substances, 0·05 per cent. of salicylic acid, and 0·0003 of formic aldehyde, quantities very much smaller than are ever found, or which would be of any value in commercial milks. Having selected by this method those samples which contain preservatives, the nature of these must be determined by the ordinary methods.

Estimation of Preservatives.—The quantity of any preservative

in milk, may be estimated by a modification of the process just described. It is not of much use in the case of borax, boracic acid, or salicylic acid, as the usual chemical methods are, for these substances, of greater accuracy than the method to be described; it may however be used as a control on the results obtained by chemical estimation. With formic aldehyde the case is different: the chemical methods for the determination of small quantities of this are very unsatisfactory. The estimation may be made as follows: take two test-tubes, and measure into each tube 10 c.c. of the milk containing formic aldehyde (solution A). Take 10 c.c. of the original milk, and dilute to 100 c.c. with milk free from preservative; measure out 2 tubes as before (solution B). Take 10 c.c. of solution B. and dilute to 100 c.c. with milk free from preservatives; measure out two tubes as before (solution C). Prepare three control tubes, of 10 c.c. each, containing 0·005 per cent., 0·003 per cent., 0·001 per cent. of formic aldehyde respectively (control A). Prepare four control tubes, of 10 c.c. each, containing 0·001 per cent., 0·0008 per cent., 0·0005 per cent., 0·0003 per cent. of formic aldehyde (control B). Treat all the tubes with litmus, heat to 80° C. and inoculate, in exactly the same manner as if testing for the presence of preservatives. Place one tube of solution A, one tube of solution B, one tube of solution C, and the three control solutions A, in the warm incubator at 38° C. for 24 hours. Place all the other tubes in the cool incubator at about 22° C. for 24 hours. From a comparison of the colours of the various tubes after 24 hours a very close approximation of the amount of formaldehyde may be made, provided that quantity does not exceed 0·5 per cent. If it exceed this further dilutions must be made.

Monsonia Ovata. J. Gordon Sharp. (*Pharm. Journ.* [4], xi. 727.) This reputed remedy for dysentery appears to contain no active principle; it is free from toxicity, an infusion of 300 grains having been taken by the author without any perceptible effect. It contains no glucoside nor alkaloid, and the astringent matter present does not exceed the amount found in ordinary tea.

Myrcenol, Constitution of. P. Barbier. (*Comptes rend.*, cxxxii. 1048.) The author does not find that the alcohol which is produced by the hydration of myrcene is licareol (linalool), as stated by Power and Kleber. On the contrary, it is a new alcohol, $C_{10}H_{18}O$, myrcenol, to which he attributes the constitutional formula:

$$(CH_3)_2C{:}CH.CH_2.CH_2.C(CH_3).OH.CH{:}CH_2$$

which is precisely the formula attributed by Tiemann to licareol.

But the new alcohol differs so entirely from that body in physical properties and products that Tiemann's formula will need revising. Myrcenol boils at 99–101° at 10 mm. pressure, and when acetylized gives an acetate differing entirely from licareol acetate in odour. Myrcenol is very easily polymerised. By oxidation it yields an aldehyde which is not citral; it boils at 110° C. at 10 mm. pressure; its oxime boils at 148–150° C. at 10 mm., and its semicarbazone melts at 195–196° C.

Naphthols, Distinction between. E. Vincent (*Repertoire* [3], xiii. 216) finds that a solution of iodic acid serves to distinguish α- from β-naphthol. With the former it gives a yellowish white colour, which rapidly becomes violet. With the latter the precipitate gradually turns red. On standing the liquid is coloured yellow, and the precipitate a reddish brown.

Nataloin. A. Tschirch and J. Klaverness. *Archiv der Pharm.*, ccxxxix. 231. The authors agree with Léger in attributing to nataloin the formula $C_{16}H_{18}O_7$. They obtain it by removing the resin by macerating the aloes in an equal weight of strong alcohol, draining the residue and recrystallising it from alcohol 70 per cent., by which method a yield of 15 to 16 per cent. of crystalline aloin is obtained in quadratic tablets, which, however, have not a very sharp melting point. By recrystallisation, first from acetic acid and then from alcohol, it is obtained in fine needles which melt sharply at 202°–204° C. Nataloin is almost insoluble in water, ether and chloroform. It is fairly soluble in warm acetic acid, and in alcohol 70 per cent., readily dissolved by alkalies and alkaline carbonates. It reduces ammoniacal silver solution. It is readily acetylised by treatment with acetic anhydride and sodium acetate. The alcoholic solution of the products of this reaction deposits colourless quadratic crystals, which melt at 240° C. The authors do not agree with Tilden that this body is a hexacetyl-nataloin, but consider it to be a condensation product, which is then acetylated. The mother liquor, after the separation of this body, contains a yellow amorphous substance, which gives a marked blue fluorescent solution with dilute alcohol, and on analysis is found to contain 5 acetyl groups. It is then pentacetyl-nataloin, $C_{16}H_{13}(CH_3CO)_5O_7$. It melts at 125–126° C. By benzoylating nataloin with benzoyl chloride in alkaline or in pyridine solutions, a pentabenzoyl derivative was also obtained, $C_{16}H_{13}(C_6H_5CO)_5O_7$. Since nataloin has been found to contain one methoxyl group, and the above results point to the presence of five hydroxyl groups, its constitutional formula may be expressed as $C_{15}H_{10}O(OH)_5(OCH_3)$. The

resin of Natal aloes is found to be the paracoumaric ester of nataloresino-tannol.

The aqueous liquid obtained in the course of the precipitation of the resin was of a deep red colour, which, when neutralised with ammonia, evaporated, and extracted with chloroform, gave a pomegranate red amorphous body, nataloin red, which is soluble in water, giving a permanently red-coloured solution, from which the colour is discharged by reducing agents, such as pyrogallol or sodium bisulphite. It is probably an oxidation product.

Nerium Odorum, Chemistry of. R. C. S. Bose. (*Proc. Chem. Soc.*, xvii. 92.) Modifying the methods of H. G. Greenish, a third constituent, karabin, as well as the previously reported neriodorein and neriodorin, has been isolated. This is removed from the ether extract by treatment with alcohol, which leaves the glucoside as a viscous brown residue on evaporation. Neriodorin was found in the alcoholic extract of the root exhausted by ether, and neriodorein in the water extract following treatment with alcohol. Karabin may also be obtained by extracting the root directly with alcohol, treating the acidulated aqueous solution of this extract with ether, after removing the oil with petroleum ether. After extracting karabin, the acid watery solution yielded neriodorin and neriodorein, the former separating in the form of floating granules. Neriodorin is considered to be a saponin. Kabarin and neriodorein possess the characters of resin, and are not glucosides. Both are free from nitrogen.

Neroli and Petitgrain Oil. Jeancard and Satie (*Bull. Soc. Chim.*, xxiii. 605.) The authors have observed the characters of these oils, on the spot, during the harvest. They report that the yield of *neroli oil* is markedly influenced by the weather; a much larger yield being obtained when it is fine. The mean figures obtained from thirteen samples of neroli oil taken at different periods during the harvest were: yield, 0·963 Gm. per kilo.; sp. gr. 0·8758; rotation + 4° ·08′; esters (as linalyl acetate) 15·19 per cent. In four samples of *Bigarade petitgrain* oil the extreme limits were: sp. gr. from 0·8866 to 0·8946; rotation − 2° 40′ to − 5° 19′; esters 47·14 to 67·81 per cent. *Lemon petitgrain* had the sp. gr. 0·8768, and rotation + 13° 20′, with 12·25 per cent. of esters. *Mandarin petitgrain* gave a sp. gr. of 0·8768; rotation + 6° 14′; esters 45·06 per cent. That considerable saponification of the esters takes place during the distillation of neroli oil is evident from the fact that the oil extracted by cold maceration with vaseline oil contained 23·76 per cent., or 11·6 per cent. more than that yielded by distilla-

tion. The odour of this oil, and also that of fresh orange flowers, is quite different from that of neroli oil obtained by distillation.

Nicotine in Tobacco, Determination of. Jules Folh. (*Repertoire*, xiii. 224, after *Rev. Internat. des Falsific.*) 6 Gm. of the dried and powdered leaves are thoroughly moistened and mixed with 10 c.c. of dilute caustic soda solution, then sufficient plaster of Paris is added to produce a perfectly dry mass, and powdered. This is introduced into a tall, well-stoppered cylinder, and treated with 100 c.c. of a mixture of ether and petroleum ether, and allowed to stand for one hour with occasional agitation. 25 c.c. of the solution is then withdrawn, 40 or 50 c.c. of distilled water added, a drop of iodeosine, and a known quantity in excess of N/10 H_2SO_4 solution. The amount of free acid is then titrated back with N/10 NaHO in the usual manner.

Nitric Nitrogen in Drinking Water, Determination of. H. Henriet. (*Comptes rend.*, cxxxii. 966.) Advantage is taken of the reaction first discovered by Divers that an acid solution of stannous chloride converts nitric acid into hydroxylamine. The author finds that at a boiling temperature this reaction is quantitative, according to the equation,

$$3SnCl_2 + KNO_3 + 8HCl = 3SnCl_4 + KCl + NH_2OH.HCl + H_2O$$

He then determines the remaining $SnCl_2$ by means of solution of iodine according to the equation $SnCl_2 + I_2 + 2HCl = SnCl_4 + 2HI$. From this it will be seen that 6 atoms of iodine are equivalent to 1 atom of nitrogen. The standard solution of stannous chloride is prepared by dissolving 14 Gm. of pure tin in pure HCl, and making up to 1,000 c.c. It is stored in a vessel fitted with a cork pierced with two holes, one carrying a tube leading to a generator of CO_2, the other attached to a syphon tube bearing a 10 c.c. pipette fitted with two tubes, one of which also communicates with the CO_2 generator. In this way a known volume of the solution can be drawn off without access of air. The iodine solution is made by dissolving 8 or 9 Gm. of iodine in water with 20 Gm. of KI, and making up to a litre. This is standardized with a solution of thiosulphate in the usual way, or with a solution of potassium nitrate of known strength in the manner described below. If x = the weight of iodine in 1 c.c. of the solution, its equivalent in nitrogen will be $\frac{14 \times x}{762}$. Fifty c.c. of the water to be examined is

evaporated to dryness on a sand-bath at 110° C. When cold 10 c.c. of HCl and 10 c.c. of the stannous chloride solution are added, the flask closed with a cork bearing a short glass tube to which a piece of rubber tubing is attached on the outer end. The mixture is then boiled for ten minutes, a blank experiment, without nitrates, being performed simultaneously. The flasks are then removed from the source of heat, the open rubber tube being pinched with the fingers to prevent entry of air, and then attached to a CO_2 generator. When cold, 10 c.c. of water is added, and the contents titrated in the usual way with iodine solution. The difference in the two results will indicate the amount of stannous chloride converted into the stannic state, and by inference, the amount of nitric nitrogen present.

Nutmeg, (Essential) Oil of. M. W. Allen and E. T. Brewis (*Pharm. Journ.* [4], xii. 328.) This was described in the 1885 Pharmacopeia as "the oil distilled in Britain from nutmeg," but no tests were given. In the present Pharmacopeia the words "in Britain" are deleted, and the following characters added:

(1) Sp. gr. from 0·870 to 0·910.

(2) It is required to be soluble in an equal volume of 95 per cent. alcohol.

(3) A little evaporated on a water-bath should not leave a residue which crystallizes on cooling.

The German Pharmacopeia, Edition IV., gives the sp. gr. as 0·890–0·930, and Gildemeister and Hoffmann, in their excellent work, *The Volatile Oils*, give the limits for sp. gr. as 0·865–0·920, and the optical rotation as between + 14° and + 28° in 100 mm. tube. They further state that "when evaporated a small amount of a fatty substance, consisting principally of myristic acid, remains behind."

The results obtained by the authors on "normal" oils tend to confirm the figures of the two latter authorities, rather than those of our present Pharmacopœia, and it is only by a process of fractional distillation and then by the rejection of certain portions that the requirements laid down can be met. This being so, either the description "the oil distilled from nutmeg" requires some qualifying phrase, such as "by fractionation," or else the tests given would seem to require modification. As to which of these two adjustments would be the better, it is difficult to say, it having been stated that the presence of the small amount of fatty matter which undoubtedly comes over towards the end of the distillation should be carefully avoided (*vide Pharm. Journ.* [3], xxiv. 935), and we

are told that "the presence of this body" (the residue on evaporation over a water-bath) "appears to cause an unpleasant preponderance of the nutmeg over the lemon flavour in sal volatile, and hence should be carefully avoided."

Assuming that the heavier fractions of the distillate contain an essential part of the flavour of the nutmeg, and this is our experience, would it not be more reasonable to reduce the quantity of the oil in the preparation of, say, sal volatile, rather than eliminate portions of the flavouring matter from the oil itself, thus altering its character?

About fifty samples were recently collected from the various fractions obtained during the distillation of at least twelve separate charges, representing in all about a ton of nutmegs. These samples were then tested separately for sp. gr. and optical rotation. These are compared with two samples of exotic oil—one German and one East Indian—and an English drawn oil sampled March, 1898.

East Indian oil differs markedly in rotation and gravity, unmistakably indicating the absence of bodies which come over towards the end of a normal distillation, and which appear to contribute not a little to the complete nutmeg flavour. This seems to derive some confirmation from the statement by Gildermeister and Hoffmann, who say respecting myristicin ($C_{12}H_{14}O_3$), "the highest boiling fraction contains a substance that has a sp. gr. 1·1501 (at 25°) and an intense odour of mace." It is by no means certain that the crystalline appearance of the residue left on evaporation is due to myristic acid, for examination has shown that the residues obtained from two higher fractions amounting to $2\frac{1}{2}$ per cent. and 10 per cent respectively, consisted principally of a phenoloid body. They may contain a little myristic acid, but probably the crystalline substance noted is, in reality, Semmler's myristicin It is to be remembered that the sp. gr. of myristic acid, as given in Watts' Dictionary, is 0·8622 at 54°, while the sp. gr. obtained by the authors on the highest fraction was 1·0438 at 15°.

Nux Vomica, Alternative Method for the Alkaloidal Assay of. F. C. J. Bird. (*Pharm. Journ.* [4], xi. 574.) By substituting a menstruum of amylic alcohol 1 vol., with chloroform 3 vols., and ether 4 vols., for the alcohol chloroform mixture of Dunstan and Short rapid extraction may be obtained by the maceration method described below. If the drug be reduced to such a powder as will pass through a No. 10 sieve, it will yield less than a Mgm. of alkaloids on further extraction of with boiling alcohol chloroform, and if a fine powder be used, exhaustion will be complete.

Process for the Assay of Nux Vomica Seeds.—Nux vomica in powder, 5 Gm.; solution of potash 10 per cent., 2 c.c. Triturate in a mortar until uniformly moistened. Prepare a sufficient quantity of solvent composed of amyl alcohol, 1 vol.; chloroform, 3 vols. ether, 4 vols.

Add the moistened powder to 20 c.c. of the above solvent, previously placed in a separator plugged with cotton wool, and macerate for half an hour with occasional agitation. Adapt a pressure-ball to the separator and force out the liquid as completely as possible by air pressure. Add sufficient solvent to just cover the powder, insert the stopper of the separator, agitate vigorously, let stand fifteen minutes and again force out the liquid. Repeat this until no more alkaloid is extracted, as shown by evaporating a few drops and testing with diluted acid and Mayer's reagent. Usually five to six extractions will be found sufficient.

Agitate the mixed ethereal extracts with diluted sulphuric acid, 6 c.c.; water, 25 c.c., in three successive quantities of 11, 10, and 10 c.c. Transfer the united acid liquids to a 200 c.c. separator half filled with water at 70° F. (21·1° C.), and having the neck above the stopcock plugged with a very small pledget of cotton wool. Add a freshly prepared solution of potassium ferrocyanide, 1·25 Gm.; water, 25 c.c., and completely fill the separator with water at 70° F. (21·1° C.) Replace the stopper by a cork carrying a thermometer; if necessary, raise the temperature of the contents to 70° F. (21·1° C.), by rotating the separator in the steam of a water bath. Agitate occasionally during half an hour, then allow to remain at rest for an additional hour and a half, maintaining the temperature of the liquid at 70° F. (21·1° C.), by occasional warming when necessary. (At 70° F. precipitation of strychnine ferrocyanide invariably commences well within a minute after the addition of the potassium ferrocyanide solution.) Adapt an air-pressure ball to the separator and force out the mother liquor. Then take diluted sulphuric acid, 5 c.c.; water, 195 c.c.; mix and reduce to 100° F. (37·7° C.)

Add about 50 c.c. of the above washwater to the precipitate, rotate, and apply air pressure as before, regulating the flow of liquid by the stop-cock to a quick succession of drops. Then add the remainder of the washwater, agitate and repeat. Insert the stopper of the separator, invert and displace the cotton wool plug by means of a stiff wire passed through the open stop-cock. Then add water 10 c.c. Agitate to diffuse the precipitate, and add chloroform 7·5 c.c., strong solution of ammonia 2 c.c. Shake well

and separate. Repeat with chloroform 7·5 c.c., and again separate. To the mixed chloroformic solutions in a tared glass dish (preferably with a flat bottom) add amylic alcohol 2·0 c.c. Evaporate on a water bath and dry the residue to a constant weight. Add 8 Mgm. to the weight of the strychnine thus obtained (to compensate for strychnine ferrocyanide lost in the wash-water) and multiply the result by 20.

The packing of the cotton wool in the neck of the separator demands some little care. If too loosely packed, it is liable to become suddenly displaced during the agitation of the contents of the separator and float in the liquid, while if compressed too tightly the flow of the solvent when air pressure is applied is unduly impeded. To avoid these extremes a single tuft of cotton wool, about 3 cm. in diameter, should be placed lightly in the neck of the separator and pressed into position by means of a thin, pointed glass rod, the point of the rod being passed down as far as the plug of the stopcock, and then withdrawn. In this way the wool takes the form of a hollow cone, which filters rapidly and has no tendency to become displaced.

An "Aliquot Part" Process on the above lines is often found useful where comparative results only are required. Whilst not quite accurate, the errors incidental to the aliquot part principle are minimised by the mode of manipulation adopted: nux vomica in powder 6 Gm., solution of potash (10 per cent) 2·0 c.c. Rub to a uniform powder, transfer to a 200 c.c. stoppered separator previously plugged with cotton wool and containing solvent as above 120 c.c. Agitate occasionally during two hours, then add saturated solution of chloride of sodium 3 c.c., shake until the powder aggregates, and having adapted a pressure ball to the separator, force out 100 c.c. of the liquid into a graduated flask, taking care that the stem of the separator passes well down into the neck of the flask. Consider the 100 c.c. as representing 5 Gm. of nux vomica, and conduct the remaining part of the process as already described.

Alternative Process for the Assay of the Liquid and Solid Extracts of Nux Vomica.—Liquid extract of nux vomica, 10 c.c., or solid extract of nux vomica, 3 Gm. dissolved in hot water, 6 c.c.; alcohol, 90 per cent., 2 c.c. Place in a separator, No. 1 (three small separators are required, Nos. 1, 2, and 3), and add chloroform 10 c.c., ether 5 c.c., and after agitation, strong solution of ammonia 4 c.c. Separate and transfer the immiscible layer to No. 2. Shake this with three successive quantities of solution of ammonium carbonate (1 in 10) 5, 5 and 3 c.c., and transfer the washed ethereal

liquid to No. 3. To the mixed aqueous washings in No. 2 add chloroform 10 c.c., ether 3 c.c. Agitate, separate, and run off into the mother liquor in No. 1. Shake well, separate, and transfer the ethereal layer to No. 2 (empty), wash with ammonium carbonate solution, 3 and 3 c.c., and run off the washed ethereal layer into No. 3. To the mixed aqueous washings in No. 2 add chloroform 10 c.c., ether 3 c.c. Agitate, separate, transfer to No. 1, and extract the mother liquor a third time. Run off the ethereal layer into No. 2 (empty), wash with ammonium carbonate solution, 1 c.c., transfer to No. 3, and extract the mixed alkaloidal solutions with diluted sulphuric acid 6 c.c., 11, 10 and 10 c.c.; water, 25 c.c., 11, 10 and 10 c.c., and from this stage continue the process as described under the assay of nux vomica seeds.

Tincture of Nux Vomica.—Evaporate 100 c.c. to 8 c.c., add 2 c.c. of alcohol 90 per cent., and proceed as for the liquid extract. 50 c.c. or 30 c.c. with the solvent, and halved (up to the ferrocyanide precipitation), yield practically the same figures.

Nux Vomica, The Official Process for the Assay of. F. C. J. Bird. (*Pharm. Journ.* [4], xi. 214.) The author concludes that if the temperature of the solutions be maintained at 65° to 70° F. that two hours is sufficient time for the complete precipitation of the strychnine ferrocyanide, although in the light of the experiments of Farr and Wright (*Year-Book*, 1900, 440), this might be modified in colder solutions. The results obtained by those workers confirm the author's contention that the figures for alkaloid are not materially affected whether 5 or 10 c.c. of the original fluid extract be taken for analysis.

Ocimum Basilicum, Essential Oil of. (*Schimmel's Report*, May 1901, 12, after *Konink. akad. van Wettenschap. te Amsterdam*, 1900, 446.) P. Van Romburgh has continued his researches on basil oil and has examined the oil produced by three varieties of the herb cultivated in the botanical gardens of Buitenzorg, which, although showing but slight botanical differences, yield oils which present markedly diverse chemical characters. The variety known as "Selasih itam" only gave a trace of oil not sufficient in quantity for examination. Another variety "Selasih hidjan" yielded 0·2 per cent. of oil having a fennel-like odour, and a sp. gr. 0·948 at 25° C. It contained methyl-chavicol. The third variety "Selasih besar" yielded between 0·18 and 0·32 per cent. of oil. The sp. gr. of this was between 0·890 and 0·940 at 26° C., the opt. rot. −11·25 to −18°, and it contained from 30 to 46 per cent. of eugenol. As well as eugenol the oil contained a new terpene ocimene, $C_{10}H_{16}$,

which boils at 73°–74° C. at 22 mm. pressure, is optically inactive, has an agreeable odour, and a sp. gr. of 0·801 at 15° C. It readily absorbs oxygen and is therefore decomposed in the process of ordinary distillation, and can only be isolated by distilling *in vacuo*. When heated at ordinary pressure its boiling point rises from 176°–178° C. to 195° C. and its sp. gr. is increased. In these characters it resembles the myrcene of Power and Kleber from bay oil, but it differs from that body in its behaviour towards oxygen.

Orange Oil. E. J. Parry (*Chem., and Drugg.*, lviii. 462) states that in 1899, E. and H. Erdmann discovered the presence of the nitrogenous ester, methyl anthranilate, in oil of neroli. Last year the author found the same body, in traces, in ordinary oil of orange, showing that although the esters disappeared during the transformation of flower to fruit almost entirely, traces were still to be found in the fruit oil. The same holds good for linalyl acetate, a constituent both of neroli oils and (in traces) orange oils. The author has examined the oil obtained from the so-called "orange peas" or unripe small oranges in the very early stage of their development. This oil is of interest, since it forms the connecting link between the neroli and the fruit oil. From it he has isolated traces of methyl anthranilate in the manner previously described. A comparison of the properties of the three oils is of interest.

	Sp. gr.	Rotation.
Neroli	0·870–0·880	+4° to +15°
"Orange pea"	0·862	+71° 16′
Orange	0·850	+96°

The decrease in sp. gr. and the increase in optical rotation (which are the results of observations on numerous samples, and are therefore known to be constant) clearly show the gradual increase in the quantity of terpene present.

The oxygenated constituents of orange oil have recently been investigated somewhat fully, but those present in the "pea" oil are very different from those of the mature fruit oil, as shown from the sp. gr. of samples from which all the terpenes had been removed under similar conditions. The two terpeneless oils gave the following figures:—

	Sp. gr.	Rotation.
"Orange pea"	0·910	+6° 27′
Orange	0·898	+10° 30′

Orange Oil, Sweet. (*Schimmel's Report*, Oct. 1900, 31.) Sweet orange oil contains besides terpenes, decylic aldehyde, $C_{10}H_{20}O$, dextro-linalool, dextro-terpineol, nonyl alcohol, and caprylic acid.

Orange Oil, Mandarin. (*Schimmel's Report*, Oct. 1900, 31.) By shaking out mandarin orange oil with dilute acid, a basic body was removed which solidified at 18·5 to 19·5° C. It formed crystalline salts and was identified as the methyl-ester of methyl-anthranilic acid, $C_6H_4\left\langle\begin{matrix}NCH_3\\COOCH_3\end{matrix}\right.$. Although less than one per cent. of this body is present in the oil, it is an important factor in its peculiar and characteristic odour. It is to this base that the fine blue fluorescence of solution of mandarin oil is due.

Oroxylin. W. A. H. Naylor and C. S. Dyer. (*Proc. Chem. Soc.*, xvii. 148.) The crystalline principle oroxylin, first isolated by Naylor and Chaplin (*Year-Book*, 1890, 407) from the bark of *Oroxylon indicum* has been further examined. Its ultimate analysis corresponds to the formula $C_{19}H_{14}O_6$. It is readily acetylized, forming the tri-acetyl compound $C_{19}H_{11}(C_2H_3O_2)_3O_6$, which crystallises in colourless needles melting at 150° C., and on brominating, the dibromo-substitution product, $C_{19}H_{12}Br_2O_6$, is formed, crystallizing in needles melting at 175°. It yields benzoic acid on hydrolysing. It therefore contains three hydroxyl groups and a benzene nucleus.

Oxalic Acid, Chemically Pure. O. Schmatolla. (*Apoth. Zeit.*, xvi. 194.) 50 Gm. of commercial acid is dissolved in 120 Gm. of absolute alcohol on the water bath, allowed to cool and filtered. To the filtrate 2 or 3 drops of H_2SO_4 (1:2) is added, and after agitation, the mixture is allowed to stand all night, again filtered, and the alcohol distilled off from the filtrate, the residue dissolved in 200–300 c.c. of water, crystallised, and the crystals dried at first at 35° C., finally over fused $CaCl_2$. The crystals thus obtained are chemically pure.

Oxalic Acid in Urine. E. Salkowski (*Centr. für Med. Wiss.*, through *Chem. News*, lxxxii. 72) bases a process for the determination of oxalic acid in urine, on the property it possesses of dissolving easily and abundantly in ether, while phosphoric acid is insoluble in that liquid. Take 200 to 500 c.c. of urine, add 20 c.c. of HCl (sp. gr. 1·12), and shake this mixture three successive times with alcoholised ether (5 to 10 per cent. of alcohol). Decant the layer of ether, filter, distil off nearly the whole, then, after having added a little water, concentrate to 20 c.c. Allow to cool, and separate the resinous residue by filtration, make the solution slightly alkaline with ammonia, and add 1 to 2 c.c. of a 10 per cent. solution of calcium chloride, and acidulate with acetic

acid. The precipitate of oxalate of lime thus formed is treated in the ordinary manner.

Parsley Oil, Constituents of. C. Bignami and G. Testoni. (*Gazz. Chim. Ital.*, xxx. 240, through *Schimmel's Report*, Oct. 1900, 47.) From the products of oxidation of various fractions of parsley oil, the authors, although they have not succeeded in isolating such a body, conclude that at least 50 per cent. of the oil consists of a substance $C_{11}H_{12}O_3$, analogous to myristicin, since after treatment with permanganate, an acid, identical in composition and in melting point with the myristicinic acid, $C_9H_8O_5$, of Semmler was obtained, also small quantities of apiolic acid, tetra- methyl-apionol-carbonic acid, and trimethyl-gallic acid were isolated.

Peganum Harmala, Alkaloids of. Otto Fischer. (*Chem. Centralb.*, lxxii. 959.) By extracting the seeds of *Peganum harmala* first with very dilute H_2SO_4 in the cold, and then with heat, a mixture of bases was obtained. From this acid extract harmine and harmalene were precipitated by alkalies, while harmalole remained in solution. The two former were redissolved in sulphuric acid, the solution neutralised, and the bases salted out as hydrochlorides by means of sodium chloride. Harmine, $C_{13}H_{12}ON_2$, was obtained in glossy rhombic prisms, melting at 257° to 259° C. The alcoholic solutions of its salts had a blue fluorescence. By heating with HCl to 140° to 170° C., it is converted into harmiole, $C_{12}H_{10}ON_2$, and by oxidation with chromic acid it yielded harminic acid, $C_{10}H_8O_4N_2$. This, when heated, splits off 2 molecules of CO_2, yielding apoharmine, $C_8H_8N_2$. Harmaline, $C_{13}H_{14}ON_2$ separates out as large, dense, colourless, crystals from a mixture of alcohol and benzol. The harmalole left in the original alkaline solution is partly recovered by treatment with acetic acid and sodium acetate, the remainder shaken out with ether. It occurs in brownish crystals with a green fluorescence, which darken at 170° C., and decompose at 212° C. It has the empirical formula $C_{12}H_{12}ON_2$, and is identical with the decomposition product of the action of concentrated hydrochloric acid harmaline.

Pepsin Assay. P. Macquaire. (*Journ. Pharm. Chim.* [6], xii. 67.) Fibrin dried at 40° C. is recommended as the standard material for determining the digestive power of pepsin. If this temperature be not exceeded, the dry fibrin, 25 parts of which are equivalent to 100 parts of moist handpressed fibrin, is quite as digestible as the fresh substance. Results obtained with this are more definite than with any other material, and the products of the digestion form an easily filtering liquid.

Peppermint Oil, Russian. Lifschitz. (*Pharm. Centr.*, xlii. 400, after *Chem. Zeit. Repert.*) Russian peppermint oil of the brand Agricola was found to be somewhat inferior to Mitcham oil in flavour. Other Russian peppermint oils were distinguished by a very delicate aroma, and have a higher ester number than Mitcham oil, and contain more combined menthol. The table on page 98 shows the chief characters and constituents of the various oils examined.

Periodides of Substituted Oxonium Derivatives. J. N. Collie and B. D. Steele. (*Journ. Chem. Soc.*, lxxvii. 1114.) The fact that certain oxygen compounds, such as dimethyl-pyrone, and trimethyl-pyrone, have the property of forming salts with acids, similar to the alkaloidal salts, has been known. A further point of resemblance between these substituted "oxonium" compounds and the substituted ammonium bases, is now described in the formation of periodides by the former, which are analogous to the alkaloidal periodides. Thus dimethyl-pyrone, $C_7H_8O_2$, yields dimethyl-pyrone periodide $(C_7H_8O_2)_2HI.I_2$, when a solution of iodine in hydriodic acid is added to a solution of dimethyl-pyrone in acetic acid, and tetramethyl-pyrone, $C_9H_{12}O_2$, yields $(C_9H_{12}O_2)_2\,HI.I_2$ under similar conditions.

Persulphates. M. Moreau. (*Repertoire* [3], xiii. 162.) The alkaline persulphates are attracting a certain amount of attention in pharmacy since they are being prescribed as stimulants of the nitritive processes and the appetite. The sodium salt, $Na_2S_2O_8$, is most frequently used. It is given in the form of an aqueous solution in doses of 1½ grains or more, with food, repeated at each meal. The purity of these salts may be determined by the amount of iodine liberated from its combination with KI. 0·25 Gm. of the persulphate, is dissolved in an excess of 10 per cent. KI solution, acidulated with 2 c.c. of H_2SO_4. After standing well corked for 30 minutes, the liberated iodine is determined in an aliquot part of the solution, in the usual manner, with thiosulphate solution. An alternative method is based on the oxidation of arsenious acid in an alkaline solution in the presence of potassium iodide. Two Gm. of potassium iodide is dissolved in 50 c.c. of N/10 sodium arsenite solution, 2 Gm. potassium bicarbonate is added, followed by 0·25 Gm. of the persulphate to be titrated. The mixture is then boiled for 5 minutes, and after cooling, titrated with iodine solution. The difference will indicate the amount of arsenic oxidised, and by inference the quantity of persulphate present.

Description.	Sp. Gr.	Opt. Rot. at 20·5° C.	Solidifying point.	Boiling point.	Maumené's number.	Acid number.	Ester number.	Saponification number.	Iodine number.	Solubility in alcohol, 90%.	Menthol. Combined.	Menthol. Free.	Menthol. Total.	Menthone.
Ol. Menth. pip. russ. e fol. Menth. alb.	0·9136	− 21°20′	− 12°	160°	25·5°	1·68	48·72	50·4	65·10	1 in 1·8	13·57	43·14	56·71	36·07
Ol. Menth. pip. russ. e fol. Menth. nigr.	0·9098	− 21°29′	− 11·5°	165·5°	20°	1·12	49·28	50·4	76·49	1 in 1·8	13·72	40·63	54·35	39·03
Ol. Menth. pip. russ. "Agricola"	0·9115	− 24°10′	− 14°	180·5°	16·5°	1·12	54·88	56·0	79·51	1 in 1·4	15·28	40·34	55·62	34·00
Ol. Menth. pip. germanic.	0·9045	− 26°24′	− 14·5°	183°	18·5°	0·56	66·64	67·2	61·38	1 in 2·3	20·12	34·23	54·35	31·84
Ol. Menth. pip. angl. Mitch.	0·9024	− 24°11′	− 13°	198°	18°	0·56	21·84	22·4	66·64	1 in 4·5	6·08	46·44	52·52	39·29
Ol. Menth. pip. angl. Mitch.	0·9109	− 25°20′	− 13·5°	194°	19°	1·68	26·32	28·0	46·92	1 in 4·0	7·33	44·14	51·47	37·24
Ol. Menth. pip. amer. Hotchkiss	0·9154	− 29°17′	− 13°	154°	17·25°	2·24	36·96	39·2	61·84	1 in 1·7	10·29	47·04	57·33	20·58
Ol. Menth. pip. amer. Fritzsche	0·9097	− 26°10′	− 13°	156°	18°	1·12	21·28	22·4	63·24	1 in 1·3	5·92	50·44	56·36	23·81
Ol. Menth. pip. japonic	0·9454	− 21°40′	below − 20°	124°	20·5°	16·8	28·0	44·8	61·61	Soluble in all proportions	7·80	26·72	34·52	49·40

Peruvian Balsam, Official Test for. J. Humphrey. (*Pharm. Journ.* [4], xii. 29.) The wording of the official text is ambiguous; it should be made clear that the residue to be dried and weighed is that of the ethereal extract and not of the alkaline aqueous portion.

Phenol, Colour Reaction for. Mouseau. (*Oester. Zeits. für Pharm.*, lv. 548.) The following reaction serves to distinguish phenol from cresols. To an alcoholic solution add a few drops of ammonia, followed by an alcoholic solution of iodine. At first the colour of the iodine is rapidly removed, but on adding more, a green tint is obtained in the presence of phenol. This is not destroyed by heating or on the addition of HCl. Cresols do not produce this colour.

Phenol, Volumetric Determination of, by means of Permanganate. James F. Tocher (*Pharm Journ.* [4], xii. 360) finds that phenol may be titrated volumetrically with permanganate in the absence of other oxidisable bodies with greater accuracy than by the Koppeschaar bromine method. 1 Gm. phenol is dissolved in 1,000 c.c. of water and 10 c.c. ($=0{\cdot}01$ C_6H_5OH) taken for titration. About 3 to 4 Gm. $NaHCO_3$ is added, together with a little distilled water. 50 c.c. decinormal permanganate are now added, the liquid boiled for five minutes, and then set aside to cool a little. Dilute H_2SO_4 is now added gradually, until the mixture is neutralized, and then to decided excess. The mixture is now warmed to 60° C. and decinormal oxalic acid added, with stirring, until the colour is discharged. If the phenol is pure, 29·78 c.c. permanganate will be required for 0·01 Gm. of substance taken. It would be interesting to ascertain by titration the percentages of phenol in samples, with melting points ranging from 30° C. to 42° C. and particularly from 38·8° C. (the B.P. limit) upwards. The titration figures for liquefied phenol, and for mixtures of phenol and cresols, would also be of value.

Phenolic Esters of Boric Acid, by treating various phenols with boron trichloride. F. Hillringlass (*Pharm. Zeit.*, xlvi. 194, after *Annalen*) has succeeded in preparing a series of phenolic esters of boric acid, among others the ester of normal boric acid with phenol. This completes the series of these esters which have been synthetised, $BO.OH-BO(OC_6H_5)$, $B_2O(OH)-B_2O(OC_6H_5)_4$ and $B(OH)_3-B(OCH_6H_5)_3$. Boric-triphenylester is a colourless crystalline body melting at about 30° C. Boric-metacresyl-ester, μ-$B(OC_6H_4CH_3)_3$, is also crystalline, and melts at 40° C. Boric-trinaphthyl-ester, β-$B(OC_{10}H_7)_3$, forms colourless

leaflets melting at 115° C. All are rapidly decomposed by water, or on exposure to the air.

Picea Vulgaris, Constitution of the Oleoresin of. A. Tschirch and E. Bruening. (*Archiv*, ccxxxviii. 616.) Jura turpentine, the oleoresin of *Picea vulgaris*, is found to have the following centesimal composition. Resin acids, soluble in soda solution, about 53 per cent. These comprise, picea-pimarinic acid, $C_{13}H_{20}O_2$, soluble in ammonium carbonate solution; picea-pimaric acid, $C_{20}H_{30}O_2$, soluble in sodium carbonate solution, and crystalline; it only amounts to 1·5 to 2 per cent.; and two amorphous acids α- and β- pimarolic acids, $C_{25}H_{41}O_2$, which constitute the bulk of the acid resins. They are separable as lead salts. The portion insoluble in soda solution consists of 32 to 33 per cent. of volatile oil and 10 to 12 per cent. of indifferent resene, $C_{21}H_{36}O$.

Pinus Silvestris, Constitution of the Oleoresin of. A. Tschirch and B. Niederstadt. (*Archiv der Pharm.*, ccxxxix. 167.) The oleoresin of Finnish origin was found to contain from 60 to 62 per cent. of resin, soluble in soda solution. This consisted of silveolic acid, $C_{11}H_{20}O_2$, 1·5 per cent.; α-silvinolic acid, $C_{15}H_{26}O_2$, and β-silvinolic acid, $C_{11}H_{21}O_2$, together 58 to 60 per cent. Of these, only silveolic acid is crystalline, occurring in well formed scales melting at 138° C. It gives crystalline salts. α- and β-silvinolic acids are separated by means of their lead salts; that of the former is insoluble in alcohol while that of the latter is soluble. α-silvinolic acid begins to frit at 85° C. and is entirely melted at 90° C.; β-silvinolic acid frits at 89° C. and is entirely melted at 95° C. The portion insoluble in soda solution consists of volatile oil 15 per cent. and indifferent resene 20 to 21 per cent. The oil has the sp. gr. 0·840 at 15° C.

Pilocarpine, the Constitution of. H. A. D. Jowett. (*Journ. Chem. Soc.*, lxxix. 580.) The oily acid which has previously been described as the result of the oxidation of isopilocarpine with permanganate, and has the formula $C_7H_{10}O_4$, is named pilopic acid, and has been crystallised. On treating isopilocarpine with bromine under varying conditions several new products have been obtained. Dibromo-isopilocarpine, $C_{11}H_{14}O_2N_2Br_2$, is the chief product at ordinary temperatures. When bromination is conducted in acetic acid solution a small amount of monobromo-isopilocarpine, $C_{11}H_{15}O_2N_2,Br$ and small quantities of an acid, probably isopilocarpinic acid, $C_{11}H_{16}O_4N_2$ are formed. Dibromo-iso-pilocarpine is a very feeble base, does not react with methyl iodide, and regenerates isopilocarpine quantitatively on reduction. By oxidation with permanganate a

crystalline acid, pilopinic acid, $C_8H_{11}O_4N$, has been obtained. When bromine acts on isopilocarpine in aqueous solution in a sealed tube at 100° C. the two chief products formed are dibromo-iso-pilocarpinic acid, $C_{11}H_{14}O_4N_2Br_2$, and monobromo-iso-pilocarpinic acid, $C_{11}H_{15}O_4N_2Br$. The former is crystalline, the latter is an oily body. Both yield isopilocarpino-lactone, $C_{11}H_{14}O_4N_2$, on reduction. This is a crystalline neutral body entirely without basic properties, so that it may be recrystallized from dilute acids, and does not react with methyl iodide even at 100° C. Dibromopilocarpine is found also to be a very feeble base, and yields pilocarpine on reduction; in this the author differs from Pinner and Kohlhammer, nor was he able to reproduce the bromocarpic acid of those workers. A series of the various products of these compounds are described in the original paper.

Pilocarpine Derivatives. Pinner and Kohlhammer. (*Berichte*, xxxiv. 727.) Pilocarpine, $C_{11}H_{16}O_2N_2$, yields the dibasic bromocarpic acid, $C_{10}H_{15}O_4N_2Br$, when treated with bromine; oxidised with chromic acid it forms pilocarpoic acid, $C_{11}H_{16}O_5N_2$, or with permanganate piluvic acid which, as the free acid or in the form of an ester, has the formula $C_8H_{12}O_5$ or $C_8H_{10}O_5$, or as a salt $C_8H_{14}O_6$ or $C_8H_{13}O_6$. An attempt to oxidise piluvic acid further with chromic acid failed. Piluvic acid liberated from its Ba salt with sulphuric acid and evaporated *in vacuo* forms a yellowish fluid syrup. Piluvic amyl ester, a yellowish easily decomposed oil, is obtained by acting on the Ba salt with amyl bromide in amyl alcohol. Iso-hydrochelidonic acid, $C_7H_{10}O_5$, results on oxidising a 10 per cent. solution of barium pilocarpoate with a 1 per cent. potassium permanganate solution.

Pinus Pinaster, Constituents of the Oleoresin of. A. Tschirch and E. Bruening. (*Archiv*, ccxxxviii. 630.) The percentage composition of Bordeaux turpentine derived from *Pinus pinaster* is given as acid resins, soluble in soda solution about 64 per cent., volatile oil 28 to 29 per cent., and indifferent resene 5 to 6 per cent. The acid resins consist of pimarinic acid, $C_{14}H_{22}O_2$, soluble in ammonium carbonate—which is amorphous; pimaric acid, $C_{20}H_{30}O_2$, which is readily obtained in crystals, is soluble in sodium carbonate solutions. The greater part of the acids consists of the two amorphous α- and β-pimarolic acids, $C_{18}H_{26}O_2$, which are also soluble in sodium carbonate, but are amorphous.

Polycystin. W. Zopf (*Ber. Deutsch. Bot. Ges.* through *Chem. Centr.*, lxxii. 466) has isolated a new colouring matter from

the alcoholic extract of the Alga *Polycystis flosaque*. On saponifying the extract with soda, and shaking out with ether, the colouring matter, which the author names polycystin, is obtained on evaporating off the solvent, in the form of a crystalline mass, which consists of red microscopic needles and leaflets, with a metallic lustre by reflected light. Its spectroscopic characters are quite distinct from those of chlorophyll, carotin, poppy red and solanum red. Polycystin does not form compounds with alkalies: it is therefore classed with the eu-carotins.

Potassium, A New Method of Estimating. R. Adie and T. B. Wood. (*Journ. Chem. Soc.*, lxxvii. 1076.) To precipitate potassium from solutions of its salts, a solution of sodium cobaltinitrite (de Koningh's reagent) is employed. This is prepared by dissolving 113 Gm. of cobalt acetate in 300 c.c. of water, and 100 c.c. of acetic acid; 220 Gm. of sodium nitrite are also dissolved in 400 c.c. of water. The solutions are filtered and mixed, the nitric oxide removed by evacuation. After standing for 24 hours, the yellow precipitate which forms is filtered out, and the filtrate made up to 1 litre. The yellow crystalline precipitate which is formed by this reagent in a few minutes when mixed with solutions of potassium salts, was found to have the composition $K_2NaCo(NO_2)_6H_2O$; its solubility is less than 1 : 20,000. For gravimetric determinations equal volumes (10 c.c.) of the reagent, and approximately a 1 per cent. solution of the potassium salt are mixed, with the addition of 1 c.c. of strong acetic acid. The mixture is allowed to stand over night, then collected on a tared filter, washed with 10 per cent. acetic acid until the washings are colourless, then once with water, finally drying at 125° C. It is important that precipitation should be conducted from a solution containing between 0·5 and 1 per cent. of K_2O, to obtain a precipitate which may be readily manipulated. For the volumetric method the precipitation and washing are carried out as above, but the filtration must be made through asbestos in a Gooch filter. When washed, the precipitate and plug are transferred to a beaker, and treated with dilute sodium hydroxide. The asbestos and precipitated cobalt hydroxide are then filtered off, and the filtrate which contains all the nitrite of the precipitate, is made up to 100 c.c. 20 c.c. of this is acidified, and then titrated with N/10 potassium permanganate solution. A second determination is then made with a like quantity, the amount of permanganate used in the first being added before acidification, and finally more run in after adding the acid, until the pink colour,

lasting one minute, is obtained, with one drop of permanganate. In this manner loss of oxides of nitrogen is avoided. Both methods give results which compare very favourably with the platinic chloride gravimetric method generally used.

Potassium Bromide, Test for Thiocyanates in. F. A. Upsher Smith. (*Pharm. Journ.* [4], xii. 460.) The official test for the presence of thiocyanates in KBr is found to be useless, unless the amount of Fe_2Cl_6 solution employed be strictly limited, since a large excess of the reagent liberates bromine, and leads to erroneous conclusions. It is suggested that the wording of the test be modified as follows: "0·5 Gm. of the salt dissolved in 10 c.c. of water should give a yellow, and not a red or reddish brown coloration on the addition of 2 drops of test solution of ferric chloride (absence of more than 0·01 per cent. of ammonium thiocyanate)."

Potassium Iodide, Determination of the Purity of. T. S Barrie. (*Pharm. Journ.* [4], xi. 58.) The author claims that the following process gives accurate results for the determination of KI in the presence of bromides and chlorides. The principle of the process is as follows: When a mixture of potassium chloride, bromide, and iodide is dissolved in water, and treated with a 5 per cent. solution of potassium bichromate, and a 10 per cent. solution of sulphuric acid, iodine, and iodine only, is liberated. The iodine is extracted with an immiscible solvent, carbon bisulphide or toluol, and titrated with decinormal thiosulphate solution, and from the iodine found, the potassium iodide is calculated. The analytical process requires the following solutions: (1) Decinormal thiosulphate solution; (2) Iodine solution (decinormal or otherwise), the strength of which, relative to the thio. solution, is known exactly; (3) Potassium bichromate in 5 per cent. aqueous solution; (4) Sulphuric acid in 10 per cent. aqueous solution. Weigh out about 0·5 Gm. of potassium iodide, dissolve in 20 c.c. of water contained in a stoppered separator, add 10 c.c. each of bichromate and acid, allow to stand three or four minutes, then add 60 c.c. of toluol and shake vigorously. When the mixture has separated, run off the lower yellow acid stratum, and wash the toluol by agitation with various small quantities of water, adding the washings to the first separate. The mixed washings are treated with more toluol in another separator, and if the solvent be coloured violet, it is, after washing, added to that previously separated. The coloured toluol is then shaken out with about 35 c.c. thio. solution;

the thio. is run off, the toluol washed to free from adherent thio. solution, and washings added to first separate. The separated thio. is now titrated with iodine solution to determine the excess of thiosulphate which is deducted from the volume taken. As 16·473 Gm. potassium iodide equal 1,000 c.c. N/10 thio. solution, the percentage of iodide in the sample can easily be calculated.

Quartz, Vitrified. W. A. Shenstone. (*Chem. News*, lxxxiii. 205.) The splintering of quartz in the flame, which is one of the greatest difficulties met with when attempting to work the material by heating, may be overcome by heating fragments to about 1000° C. and then plunging them into cold water. It then assumes a white enamel-like appearance. After the treatment has been repeated, the product may be thrust into the hottest part of the oxyhydrogen flame without splintering. A rough rod of these particles is made by pressing together their edges softened in a "mixed gas" jet. This rod is then reheated and drawn out into finer rods, the heat being applied slowly, and from below upwards, to avoid bubbles. A few of these finer rods are then bound round a platinum wire, or twisted in a spiral and heated until they run together. The rough tube thus obtained is reheated, drawn out, and the end sealed. A bulb is blown at the end, and this, when drawn out, gives a fairly regular tube, which may be lengthened by adding pieces of softened quartz to the end and again blowing out and drawing. Small bulbs may be enlarged by attaching particles of quartz in rings round the bulb and heating until they begin to spread, and then blowing. From the peculiar properties of vitrified quartz, apparatus constructed of it will probably be invaluable for certain physical and chemical purposes, such as the construction of thermometers, and of containing vessels for electro-spectroscopic experiments. Its coefficient expansion is remarkably low, only 0·00000059. Its expansion is extremely regular up to 1000° C., and if that temperature be not exceeded, the rod returns exactly to the same length on cooling. Beyond 1000° C. a slight permanent elongation occurs, but it remains solid up to 1500° C. Apparatus constructed with quartz may be exposed to sudden and great changes of temperature; it may even be plunged while white hot into cold water without cracking or being in any way damaged. It must not, however, be employed for hot alkaline bodies, nor for basic oxides at high temperatures. During the process of manipulating vitrified silica in the blow pipe, the precaution must be taken to protect the eyes with darkened spectacles,

the glasses of which are so dark that the white hot quartz does not appear very bright when viewed through them.

Red Rain, Composition and Nature of. T. L. Phipson. (*Chem. News*, lxxxiii. 160.) From the composition of the residue left by red rain the author considers it to be of meteoric origin. It is of a mineral nature, and contains nickel in considerable quantities. The presence of this metal points to the probability of the cosmic origin of the dust rather than to its being derived from desert sand or even volcanic dust. No nickel has been found in the cinders of Etna, Hecla, or Vesuvius, but is said to have been found in the rapilli of the Kolerberg to the extent of 0·1 per cent. In the fawn-coloured dust of red rain the amount is more than ten times as great. When calcined, the dust loses 14·3 per cent. of water and organic matter, exactly the amount found in the Orgueil meteorite. The microscopic appearance of this red rain dust is interesting. When dry it is of a fawn colour, rather paler than oxide of cerium, but becomes darker when wet. Under the microscope it is seen to consist of exceedingly minute grains, mostly flat, and of various colours; they are also of various shapes and sizes. The largest are about $\frac{1}{50}$ of a mm.; the greater number are about $\frac{1}{200}$, and the smallest $\frac{1}{2000}$ of a mm. in diameter. The irregularity of their forms gradually disappears as they get smaller, so that to the eye the smallest appear circular. Many are white, and more or less transparent, grey, greenish-grey, slate-coloured; others are yellow, and brown, and translucent; a few are ruby-red, and others are dark and opaque.

Resins, Classification of. A. Tschirch. (*Journ. Pharm. Chim.* [6], xii. 409.) The results of a long series of researches on the exudations of plants enables the author to class resinous products in three groups. The first are named "tannol-resins," since they contain esters of certain resin alcohols, which resemble tannin in some respects. These alcohols are named resinotannols. The tannol resins include the subclass benzo-resins, such as benzoin, Peru and Tolu balsams, and other resins containing esters of benzoic and cinnamic or cumaric acid; also the Umbelliferous gum resins. The second group includes the "resene resins," so called because the chief constituent is the indifferent "resene," insoluble in alkali, having neither acid nor ethereal characters. This includes the Burseraceous oleoresins of the myrrh or olibanum type, the various elemis, mastic and Dipterocarpous resins, such as dammar and gurjun balsam. The third group, "terpino resins,"

is distinguished by containing free resin acids; to this belong the various coniferous resins and the copaiba balsams.

Rhamnus Catharticus, Constituents of the Fruits of. A. Tschirch and R. Polacco. (*Archiv*, ccxxxviii. 459.) Rhamnocitrin, $C_{13}H_{10}O_5$, is obtained in yellow crystals, melting at 221–223° C., by shaking out the watery extract of the berries with ether, and extracting the ethereal residue with alcohol. By treating the alcoholic extract with toluene, rhamnolutin, $C_{15}H_{10}O_6$, is left insoluble, as yellow crystals, melting above 260° C. The toluene takes into solution rhamnochrysin, $C_{13}H_{12}O_7$, forming orange yellow crystals, which melt at 225–226° C. As the fruits ripen, less rhamnocitrin, and more rhamnochrysin, are formed. When the aqueous extract, after extraction with ether, is hydrolised with dilute sulphuric acid, β-rhamnocitrin, $C_{13}H_{10}O_5$, as well as rhamnocitrin, is formed; the former separates first from alcohol, and melts above 260° C. The berries exhausted by water yield a precipitate, when percolated with a 1 per cent. solution of ammonia; on acidifying the percolate, this yields an emodin when treated with alcohol, and leaves a nigrin insoluble. This rhamno-emodin, $C_{15}H_{10}O$, forms orange red crystals, and melts at 254–255° C., and is closely allied to frangula-emodin. The insoluble rhamno-nigrin yields chrysammic acid when oxidised with nitric acid, and is probably a decomposition product of rhamno-emodin. The purgative action of the drug is attributed to this last named constituent.

Rose Oil. E. J. Parry (*Chem. and Drugg.*, lvi. 126), from the examination of authentic specimens of Bulgarian otto of rose obtained at the Paris exhibition, concludes that the P. B. official description and tests would exclude much genuine otto. In the first place, the botanical source is limited to that of *Rosa damascena*, which would exclude the whole of the otto distilled at Leipsic and in the Alpes maritimes district from *R. centifolia*. Even in Bulgaria a large proportion of the otto is obtained from *R. alba*, which is used for hedges, and the flowers are almost invariably distilled mixed with those of *R. damascena*. A sample of otto distilled solely from these white roses is characterised by the large amount of stearoptene present; it gives the following figures. Its congealing-point is 23·5° to 24° (the Pharmacopeial limits are 19·4°–22·2°); sp. gr. at 30°, correspondingly low 0·8482 (Pharmacopœial limits, 0·56–0·860); optical rotation for 100 mm. –2° 21′; saponification value (per cent. KOH) 0·9. This otto has a very fine odour, and is of undoubted purity. It is, however, outside

official limits. Four other typical samples from individual districts gave the following figures :—

—	Congealing-point	Sp. gr. at 30°	Rotation.	Saponification.
1.	22·5°	0·8540	–2° 46′	0·81 per cent.
2.	22°	0·8509	–2° 37′	0·76 ,,
3.	22°	0·8505	–2° 46′	0·78 ,,
4.	21·5°	0·8518	–3° 10′	0·90 ,,

These samples were specially selected from districts where a larger amount than usual of white roses is distilled. They are all ottos of the finest odour and of authentic origin. A specimen of petal otto, distilled solely from petals picked by hand free from calices, was an oil of most exquisite odour, having a sp. gr. of 0·858 at 30°, congealing-point 18·5°–19°, and optical rotation –2° 27′.

Rose Oil, German. (*Schimmel's Report*, May 1901, 48.) German otto of rose contains about 10 per cent. more stearoptene than Bulgarian otto, with a lower percentage of alcohols, notably less citronellol, and has a lower optical rotation from –0° 44′ to –0° 52′, compared with –2° 20′ to –2° 58′ for Bulgarian oil. The oils of German origin yielded from 54 to 60·44 per cent. of total alcohols, of which from 13·34 to 16·49 was citronellol, while Bulgarian otto was found to give from 66·7 to 70·8 per cent. of total alcohols with 25·7 to 28·9 per cent of citronellol. In the oils freed from stearoptene the total alcohol in the German oil rose to 90·8 and 93·78 per cent., compared with 86·6 to 87·04 in Bulgarian oil. While the citronellol content of the former was 20·8 to 22 per cent., and in the latter 34·9 to 35·5 per cent. Citronellol was determined by formylating 10 c.c. of the oil by heating it with twice its volume concentrated formic acid, and then determining the amount of formic ester by quantitative saponification, in the usual manner. By this means geraniol and linalool are decomposed, only citronellol being esterified. The method is not quantitatively exact, but it gives results which are of value for comparison. It is significant that admixtures of one or even two volumes of geranium oil with German rose oil give products which afford figures closely analogous to those obtained from Bulgarian otto.

Rose Oil, German, Some Constituents of. (*Schimmel's Report*, Oct. 1900, 55.) The following have been identified as forming natural constituents, besides geraniol, of German otto of rose: normal nonyl aldehyde, citral, l-linalool, normal phenyl-ethyl alcohol, and l-citronellol. Phenyl-ethyl alcohol is only present to a small

extent in the otto obtained by distillation, but is an important constituent of the oil extracted by solvents from rose petals.

Rose Oil, Phenyl-ethyl Alcohol in. H. Von Soden and W. Rojahn. (*Berichte*, xxxiii. 3,063.) The authors state that the small proportion of phenyl-ethyl alcohol met with in ordinary rose otto, which is steam distilled, is accounted for by the fact that it is very soluble in water. In rose oil extracted from rose pomade, the authors have found 46·5 per cent. of phenylethyl alcohol, and in the essential oil extracted from rose petals by a volatile solvent 25 per cent. In distilled otto it is only present in small quantities, but more is obtained after saponification than before, pointing to its probable occurrence as esters. It is extracted from the aqueous distillate of rose oil by agitation with ether.

Rue Oil. H. Thoms. (*Berichte Pharm.*, xi. 3.) Rue oil contains no terpenes. Its chief constituent is methylnonyl ketone, $CH_3.CO.(CH_2)_8.CH_3$, which, when pure, is not fluorescent. Its semicarbazone, $\begin{matrix} CH_3 \\ C_9H_{19} \end{matrix}\!\!>C=N-NH-CO-NH_2$, crystallises in small shining leaflets melting at 123°–124° C. Rue oil also contains about 5 per cent. of n-methylheptylketone, CH_3–$CO.(CH_2)_6.CH_3$, which has not before been isolated. It is a colourless aromatic oil solidifying at –19° C., remelting at about –17° C. Its sp. gr. at 20° C. 0·83107. It distils when not quite pure between 95·8° and 103° C. Its semicarbazone crystallises in fine needles melting at 118–119° C. It forms normal caprylic acid when oxidised with sodium hypobromite. By heating together a mixture of barium acetate and caprylate a small quantity of the same methylheptylketone was obtained. The author was unable to find either the ketone, $C_{12}H_{14}O$, or lauric aldehyde, stated by Williams to be present in the oil. He has however found a trace of a fatty acid, and also of a phenol, but in too small quantity for identification.

Rue Oil, Algerian. H. Von Soden and K. Henle. (*Pharm. Zeit.*, xlvi. 277.) H. Thoms has shown that normal methylnonylketone is the chief constituent of ordinary rue oil, which also contains a smaller amount of normal methylheptylketone. The authors found, that in Algerian rue oil, n-methylheptylketone largely predominates, so as to affect the characters of the oil and cause it to differ markedly from the usual type. Thus its sp. gr. is 0·843 at 15° C.; the opt. rot. –5°, and it does not solidify even at –15° C. It contains, in addition to methylheptylketone, small quantities of methylnonylketone, and the ester of an unidentified alcohol.

Saccharin, Determination of, in Alimentary substances. H. Defournel. (*Journ. Pharm. Chim.* [6], xiii. 512.) Two hundred and fifty c.c. of liquid to be examined is acidulated with dilute H_2SO_4, shaken out with 3 successive portions of 50 c.c. of a mixture of equal volumes of ether and petroleum ether, the ethereal extract evaporated to dryness, the residue treated with ammonia, heated on the water bath until all excess of the latter is driven off, and the final residue taken up with water. This aqueous solution is then introduced into a nitrometer, or ureometer, and treated with hypobromite solution, precisely as in a urea determination. Each 0·1 c.c. of N evolved ÷ 8·9 indicates in centigrammes the amount of saccharin in the liquid taken. The process is based on the fact that the ammonium salt of saccharin is entirely decomposed by hypobromite solution liberating the whole of its nitrogen.

Saccharinates, Metallic. H. Defournel. (*Bull. Soc. Chim.*, xxv. 322.) Saccharin acts as a monobasic acid and readily forms crystalline salts, having the formula $MC_6H_4\left\langle\begin{matrix}CO\\SO_2\end{matrix}\right\rangle N$, which may either be obtained by the double decomposition of sodium sacchannate in aqueous or alcoholic solution with metallic sulphates, or by the decomposition of the carbonates with saccharin. A table of the salts prepared, showing their characters and solubilities, is given.

Saffron, Colouring matter of. A. Helger. (*Chem. Centr.*, lxxi. 576.) The colouring matter of saffron is stated to be a phytostearyl ester of palmitic and stearic acid. It is accompanied by a volatile oil which contains a terpene, pinene, and cineol. Saffron also contains a solid hydrocarbon of the C_nH_{2n+2} series, which melts at 71° C.

Samarium Carbide. H. Moissan. (*Comptes rend.*, cxxxi. 925.) Samarium carbide, SaC_2, has been obtained in the form of minute hexagonal crystals, by heating samarium oxide with sugar charcoal in the electric furnace. It decomposes on contact with water, yielding a number of solid and liquid hydrocarbons and a mixed gas containing 70 per cent. of acetylene. In this respect it resembles yttrium carbide, and differs from the carbides of the rare metals of the cerium group. The density of the crystals is 5·86. It is not reduced by hydrogen at 1000° C.

Samadera Indica. J. L. van der Marck (*Archiv der Pharm.*, ccxxxix. 96.) finds that the seeds of *Samadera indica* contain 8·89 per cent. of a fatty oil consisting of 3·89 per cent. of

tristearin and 87·7 per cent. of triolein; an albuminoid, soluble in alcohol and in water; cane sugar; a reducing sugar, inosite; and a crystalline bitter principle, samaderin, $C_{29}H_{34}O_{11}$, which gives a characteristic violet colour-reaction with sulphuric acid. It is distinctly toxic in its action on cold-blooded animals, less poisonous on those having warm blood. The bark also contains samaderin, as well as another bitter principle, probably an anthraquinone derivative, which crystallises in a mass of yellow scales. The wood contains a bitter principle which crystallises in rhombic prisms, and another bitter substance allied to quassin.

Sandalwood Oil, East Indian, Chemistry of. M. Guerbet (*Bull. Soc. Chim.*, xxiii. 540, and *Journ. Pharm. Chim.* [6], xi. 595), H. von Soden (*Archiv*, ccxxxviii. 353), and F. Mueller (*Ibid.* 366.) The first author corrects an error in his previous communication (*Year-Book*, 1900, 168) as to the sp. gr. of the original oil worked upon. This is now stated to be 0·9871 at 0°C instead of 0·9684. *α-* and *β-santalene* acetylise with difficulty under pressure. Their hydrochlorides have optical rotations in the opposite direction to that of the original sesquiterpenes, that of α-santalene hydrochloride being + 6° 1′, and of the β-compound + 8°. α-santalene gives only one nitrosochloride, $C_{15}H_{24}NOCl$, which is crystalline, insoluble in alcohol, and melts at 122° C. β-santalene gives two isomeric nitrosochlorides, both crystalline and soluble in alcohol, from which they are separable by fractional crystallisation, since their solubility differs. The less soluble melts at 101° C., the more soluble at 106° C.

The two *santalols* have been further examined, being isolated by the phthalic anhydride method, and separated from each other by fractional distillation. *α-santalol* boils at 162–163° C. at 13 mm. pressure, equivalent to 300-301° C. at atmospheric pressure. Its sp. gr. at 0° C. is 0·9854, and its opt. rot. –1° 20′ C. *β-santalol* boils at 170–171° C. at 14 mm., equivalent to 307–308° at ordinary pressure, has the sp. gr. 0·9869 at 0° C. and the opt. rot. –56°. These are primary alcohols; the sesquiterpene alcohols hitherto isolated have been either secondary or tertiary.

H. von Soden differs from the first author in the formula attributed to the santalols, $C_{15}H_{26}O$, which he considers to be $C_{15}H_{24}O$, and in the optical rotation of α-santalol, which he finds to be dextrogyre + 1° 40′ to + 2° 4′.

F. Mueller has examined the non-alcoholic constituents of the oil, among which he has isolated a new hydrocarbon, santene, C_9H_{14},

boiling at 139–140° C. It forms two nitrosochlorides, one a blue compound melting at 108°; the other white, which turns intensely blue when heated to 90° C., again turning white, and melting at 108° C. Teresantalic acid, a solid crystalline body, $C_{10}H_{14}O_2$, occurs in sandalwood oil to the extent of about 0·5 per cent. Besides this, and the santalic acid of Guerbet, another acid which has not yet been isolated is present.

Sandal Oil, West Indian. R. von Soden and C. W. Rojahn (*Pharm. Zeit.*, xlv. 878) find that the oil of the so-called West Indian sandalwood, derived from the Rutaceous tree *Amyris balsamifera*, contains two isomeric alcohols, α-and β-amyrol, having the common formula $C_{15}H_{26}O$. α-amyrol is a thick, slightly aromatic liquid, boiling at 299° C.; it is strongly dextrogyre +36°. β-amyrol is optically inactive, boils at a lower temperature than its isomer, and gives, in contact with acids, a hydrocarbon resembling cadinene. These are not primary alcohols, like the two santalols, and do not acetylise readily on boiling with acetic anhydride. When West Indian sandal oil is saponified a compound with the alkali is obtained, which is crystalline. This body the authors have named amyrolin: it has, when liberated, the composition $C_{14}H_{12}O_3$, and melts at 117° C. It is odourless and tasteless, and gives, when boiled with caustic potash, an acid which has not yet been isolated in a pure condition.

Santalenic Acid. A. Chapman. (*Journ. Chem. Soc.*, lxxix. 134.) The best results in the preparation of santalenic acid were obtained by operating as follows. To 20 c.c. of santal oil in a large flask successive portions each of 20 c.c. of 5 per cent. aqueous solution of potassium permanganate are added until oxidation is complete. The manganese oxides are then filtered off, the liquid acidified with sulphuric acid, and the precipitated santalenic acid collected and air-dried. It is then dissolved in alcohol, and water is gradually added to the solution until the point at which the acid is nearly thrown out is reached. From this solution santalenic acid crystallises out in large transparent plates. It has the formula $C_{13}H_{20}O_2$. It melts at 76° C, and boils without decomposition at 189° C. at 28 mm. pressure. Its rotation in alcoholic solution is $[\alpha_D] = +18{\cdot}05°$. A series of crystalline salts of the acid have been prepared. On brominating, a dibromo compound, $C_{13}H_{18}O_2Br_2$, melting at 114–115° C, was obtained. Among the products of oxidation, after removing santalenic acid, an oily acid with a peculiar odour was obtained, which is under investigation.

Scammony, Quantitative Examination of, for Commercial Purposes. (*Chem. News*, lxxxiii. 146.) P. L. Aslanoglou proposes the following method for the determination of the ether soluble resin in scammony. To a weighed quantity of scammony add some ether and warm gently, let it stand to settle, then filter through cotton wool. Add more ether and repeat the process three times. Wash the wool well with warm ether, and to the filtrate add enough turpentine, and let it stand for some hours, when a globular oily-looking precipitate will be found to settle down in the ether-turpentine mixture, consisting solely of scammony; any admixture of other gum-resins will be kept in solution by the ether-turpentine mixture; the scammony, being insoluble in turpentine, precipitates. Decant the ether turpentine mixture, wash precipitated scammony with fresh turpentine only, evaporate gently on a water-bath, and weigh. To estimate the earthy insoluble matters, the cotton-wool filter should be dried with its contents in a water-oven, burned and weighed; of course the ash of cotton-wool per gramme used should be known. The ether-turpentine mixture, evaporated and weighed, will give the amount of foreign gum-resins.

Schinus Molle; Oxydase in. Sarthou. (*Journ Pharm. Chim.* [6], xi. 482.) The milky juice of *Schinus molle* contains a powerful oxydase, which is precipitated by alcohol. When freshly precipitated its oxydising action is very marked, being sufficient to convert ferrocyanides into the corresponding ferric salts. This activity is, however, much diminished by leaving the ferment in contact with alcohol, probably by a process of dehydration. The result of the first precipitation by alcohol is much more active than that of subsequent repeated precipitation. Water is necessary for the oxidising action of the ferment to take place. It does not occur between the dry oxydase and alcoholic solutions of reagents, but is immediately set up by the introduction of a little water into the mixture.

Selenium in Beer. F. W. Tunnicliffe and O. Rosenheim (*Lancet*, clx. 318 and clx. 434) suggest that possibly the presence of selenium, which is known to be extremely toxic, may account for the accentuated toxicity of the arsenic found in beer, the physiological action of which would appear to greatly exceed that of arsenious acid or its salts as usually met with and administered in medicine, even for a prolonged period. The authors find that selenium is frequently present in considerable quantity, even in so called pure sulphuric acid; they have further detected its presence in brewing sugar and in beer contaminated with arsenic.

Selenium in Beer. W. H. Willcox. (*Lancet*, clx. 778.) The author controverts the statements of the above quoted investigators. From the appearance of the mirror obtained by Marsh's test, he does not consider that selenium can be present in many of the specimens examined, since when it occurs a very small trace is sufficient to so far modify the appearance of the deposited metal that its presence could not be easily overlooked. When selenium is present the proximal portion of the mirror has a different appearance, varying from vermilion to brown red, in front of the black arsenical in the distal portion. Sulphur should be eliminated from the arsenuretted hydrogen by passing the gas through lead acetate solution in potash bulbs. Solid bodies should not be present in the stream of gas before it reaches the reducing portion of the tube. It is found that even an inert substance such as sand in the reducing tube will almost entirely inhibit the formation of the arsenical mirror.

Selenium, influence of, on certain tests for Arsenic. Otto Rosenheim. (*Chem. News*, lxxxiii. 277.)

1. Marsh's test gives no indication of the presence of selenium if it be accompanied by arsenic.

2. The magnitude of the arsenical mirror is influenced by the presence of selenium, more or less of the arsenic and the whole of the selenium being deposited in the generating flask as a red-brown combination, As_2Se_3. Under certain conditions its formation is completely inhibited.

3. Reinsch's test, as ordinarily performed, is applicable for the detection of selenium, and can be used for its separation from arsenic if silver-foil be substituted for copper-foil.

4. None of the above methods are applicable for the quantitative estimation of small amounts of selenium together with arsenic in complex organic liquids, such as solutions of brewing sugar or beer.

If the liquid containing small amounts of selenious acid be treated by Reinsch's test, substituting the copper-foil by a polished silver-foil suspended in the liquid by a silver wire, it will be noticed that the silver quickly assumes a reddish and afterwards a bluish-black tint. No selenium is deposited in the liquid. This behaviour affords a convenient test for selenium in the presence of arsenic. The latter is under these conditions either not deposited at all, or only to an infinitesimal extent. On subjecting the dry blackened silver-foil to sublimation in a glass tube over a spirit burner, a sublimate is easily obtained, the silver

reassuming its usual appearance. The sublimate consists in this case partly of selenium (producing a red tinge), and selenium dioxide. If it be desired to preserve the sublimate in its crystalline form, the tube containing it and what are, apparently, droplets of water, should be left in the desiccator over sulphuric acid for a few hours, when the characteristic fernleaf-shaped crystals of selenious acid will be obtained. Arsenic may then be obtained in the acid solution after the removal of the selenium, in the usual manner, with copper-foil.

Soap Analysis, Determination of Free Alkali. Divine (*Pharm. Centr.*, xlii. 7, after *Chem. Zeit. Repert.*) employs a N/10 solution of stearic acid for the titration of free alkali in soap. 2 Gm. of the sample is dissolved in 50 c.c. of alcohol and a known volume, in excess of N/10 stearic acid run in. The mixture is then heated on the waterbath under a reflux condenser for half an hour, when the excess of stearic acid is titrated back with N/10 soda solution. The amount of stearic acid used indicates the quantity of free alkali, hydrate and carbonate. In a second experiment the carbonate is precipitated by means of barium chloride, and the remaining free alkaline hydrate titrated as before. The difference between the two determinations will indicate the amount of carbonated free alkali.

Soaps, the Official. E. White. (*Pharm. Journ.* [4], xii. 29.) No test, such as the melting points, are given for the identification of the fatty acids liberated from the official soaps. Although these are prescribed to be made from "purified animal fat" and "olive oil," there is no test to ensure compliance with this specification.

Senna, Constituents of. A. Tschirch and F. Hiepe. (*Archiv*, ccxxxviii. 427.) The aqueous percolate of senna leaves deposits a yellowish crystalline body, $C_{14}H_{10}O_6$. When concentrated and treated with alcohol, impure cathartic acid is obtained. Upon hydrolising it yields an unstable crystalline senna-rhamnetin, which does not melt below 260° C. On percolating the leaves with very dilute ammonia and precipitating the percolate with hydrochloric acid, anthraglucosennin is obtained. It is then extracted with ether; after evaporating the solvent the ether residue was treated with toluene, which leaves insoluble a yellow crystalline substance glucosennin, $C_{22}H_{18}O_8$,. It does not melt below 260° C. nor does it reduce Fehling's solution until hydrolised with acid. From the toluene solution, light petroleum ether precipitates orange red senna-emodin, $C_{15}H_{10}O_5$, melting at 223–224° C. was obtained. The residue after extraction with ether yielded to acetone amorphous

reddish brown senna-iso-emodin, $C_{15}H_{10}O_5$ which is soluble in light petroleum ether, and senna-rhamnetin, which is not dissolved in that solvent. Acetone leaves insoluble senna-nigrin, which yields senna-emodin and senna-chryosphanic acid when hydrolised with alcoholic potash.

The purgative properties of the leaves are attributed to hydroxy-meth-anthraquinone derivatives, the amount of which is determined by the spectroscopic absorption bands. The fruits were found by this method to contain more than the leaves. Alexandria senna leaves contained the most, and Tinnevelly senna the least.

Silicon Borides. H. Moissan and A. Stock. (*Comptes rend.*, cxxxi. 139.) By fusing together pure silicon and boron by means of an electric current at an intensely high temperature, a mixture of two borides of silicon, SiB_3 and SiB_6, was obtained in the bath of fused silicon thus produced. The surrounding silicon was removed from the cold mass by the action of hydrofluoric and nitric acids. The insoluble blackish crystals of the two borides were then further purified by gentle fusion with potassium hydrate, when the mixture was found to consist mainly of SiB_6 with 10 to 20 per cent of SiB_3. The latter was removed by fusing at a high temperature with KHO, while the former was dissolved by boiling with a large excess of KNO_3. Both borides are very hard, scratching the hardest ruby. SiB_3 forms rhombic lamellæ, sometimes occurring in thin long blades, which are transparent, and of a brown or yellowish colour. SiB_6 forms thick opaque crystals with irregular facets.

Sodium Peroxide. G. F. Jaubert (*Comptes rend.*, cxxxii. 75) finds that pure sodium peroxide is yellow and not white, as generally stated. Only those commercial specimens which were contaminated with hydrate or carbonate were of a pure white colour. When pure it is not deliquescent in the air; it gradually loses its yellow colour, but shows no signs of deliquescence even when exposed for years to the atmosphere.

Soot from Mineral Coal, Composition of. H. Warth. (*Chem. News*, lxxxii. 6.) The value of soot as a plant fertiliser, giving it a direct commercial value, has induced the author to investigate its constituents of ammonium salts. The sample examined was obtained from an ordinary household chimney under which coal had been burnt, said to have come from the Cannock and Rugeley colliery, Hednesford. The sample weighed 368 Gm. The soluble matter first extracted by boiling with water, filtering, and evaporation. The product of evaporation was strongly hygroscopic,

and, in order to purify it still further, it was sublimed, so as to obtain the ammonium salts separately as sublimate. The remainder was lixiviated with water and filtered, so as to obtain the soluble fixed (non-volatile) salts separated from carbon, etc.

The following quantities were obtained :—

	Percentage of salts from the original soot.
Ammonium sulphate	0·1
Ammonium chloride	7·3
Total ammonium salts	7·4
Total soluble fixed salts	1·3

These fixed salts consisted of sulphates and chlorides of sodium, magnesium, calcium, and iron. They contained much more sulphate than chloride. The proportion may have been about three of the former to one of the latter. This explains the almost total absence of sulphate amongst the volatile portion. The sulphur trioxide was chiefly retained by the non-volatile metals, and thus it is that the volatile portion consists of nearly pure ammonium chloride. The proportion of ammonium salt in the soot is sufficient to justify the estimation in which the soot is held as a plant manure.

Storax, Test for. C. Ahrens and P. Hett. (*Pharm. Zeit.*, xlvi. 216.) The resin of storax is not entirely soluble in cold petroleum ether, but common resin, used as an adulterant, is completely dissolved. A weighed portion of storax is mixed with coarse sand, and triturated with successive portions of petroleum ether, the solution being filtered into a tared flask. When the storax is exhausted, the solvent is distilled off and the residue heated to constant weight. With pure storax the residue will have an aromatic odour. If adulterated, it will be terebinthinous. The free acid number of this residue should be between 40 to 55, and the saponification number 180 to 197. Adulterated specimens give residues having the acid number as high as 116 to 121, while the total saponification number is as low as 172 to 178.

Strasburg Turpentine, Constituents of. A. Tschirch and G. Weigel. (*Archiv*, ccxxxviii. 411.) The oleoresin consists of 56 to 60 per cent. of resin acids soluble in soda solution, and from 38 to 42 per cent. of insoluble matter. The latter comprised from 28 to 30 per cent. of volatile oil, and 12 to 16 per cent. of indifferent abietoresene, $C_{19}H_{30}O$. The acid resins comprise abieninic acid, $C_{13}H_{20}O_2$, which alone is soluble in ammonium carbonate;

abietolic acid, $C_{20}H_{28}O_2$, present only in very small quantities, soluble in sodium carbonate and crystalline; α- and β- abietinolic acids, $C_{16}H_{24}O_2$, which constitute the bulk of the acid resins. They are amorphous and are separated from each other by fractional precipitation with lead acetate.

Strychnine Residues, Decrepitation of. F. C. J. Bird. (*Pharm. Journ.* [4], xi. 286.) The loss by spurting, which is a troublesome feature attending the final evaporation and drying of chloroformic extracts of strychnine, as obtained in the alkaloidal determination of nux vomica and its preparations, may be entirely obviated by the addition of a little amyl alcohol to the solvent. Two c.c. of amyl alcohol is employed for every 15 c.c. of chloroformic solution. The time required for evaporation and drying to constant weight averages 20 minutes.

Strychnos Seeds, Carbohydrates of. E. Bourquelot and J. Laurent. (*Comptes rend.*, cxxxi. 276.) The mannose and galactose which result from the hydrolysis of the glucosidal bodies in the seeds of *Strychnos nux vomica* are considered to be the products of several polymeric mannanes and galactanes. When the carbohydrates of Ignatius beans, previously extracted with alcohol, are hydrolised with dilute sulphuric acid solutions of different strength, under the same conditions, the amount of total sugar produced is different, and the amount of mannose is much greater in the product of the action of the stronger acid, containing 3 per cent. of H_2SO_4. In nux vomica the duration of the hydrolytic process is found to influence the result. Much more mannose was formed in an experiment extending over a period of 160 minutes than in one conducted for 80 minutes. Even after complete hydrolysis with 3 per cent. H_2SO_4, the residue of Ignatius beans yields a further amount of mannose, but no galactose, when treated by the method of Bracconot-Flechsig.

Sugar, A Delicate Test of. E. Riegler. (*Schweiz. Woch. für Chem. und Pharm.*, xxxix. 105.) A delicate test for sugar is afforded by the following method. Phenylhydrazine hydrochloride (about 0·1 Gm.), sodium acetate (about 0·5 Gm.), and the solution to be tested 1 c. cm. are warmed in a small porcelain dish, until the salts are dissolved. Then carefully, without moving the dish, drop in 20–30 drops of soda solution (10 per cent.) In the presence of a small quantity of sugar the whole liquid becomes red violet in a few minutes. If there is no sugar present, the colour is a dark rose in a quarter to half an hour. It is a useful method for testing urine, which in the presence of sugar developes the violet tint

in one minute. This reaction also occurs with aldehydes, so that, in their presence, sugar cannot be tested for.

Sulphammonium. H. Moissan. (*Comptes rend.*, cxxxii. 510.) The purple liquid obtained by the combination of liquefied ammonia and sulphur has been further examined. The temperature at which this body is formed differs with the three allotropic conditions of sulphur. None of them combine with liquefied ammonia at –80° C. The first to show the purple colour is insoluble sulphur, the characteristic tint becoming evident at –38° C.; then prismatic sulphur combines at –15·5° C., but the octahedral form does not yield a purple solution until the temperature reaches –11° C. That the coloured solution is a true compound is evident from the facts that it does not deposit sulphur on cooling, and solidifies at 4° or 5° below the congealing point of ammonia. It is stable in sealed tubes when heated up to 90° C.; above that temperature it gradually loses colour, and at 150° C. is completely dissociated, and sulphur is separated. On cooling, the liquid at first condensed is colourless, but gradually re-develops the purple tint as the temperature falls. By cooling to –40° under a pressure of 40 atmospheres, sulphammonium has been obtained in a crystalline condition in the form of small ruby red crystals. The composition of this body has not yet been definitely established; data at present available point to the formula $(NH_3)_2S.2NH_3$ between 0° and 20° C., while at –23° C. it is probably $(NH_3)_2S.NH_3$.

Tannase. A. Fernbach (*Comptes rend.*, cxxxi. 1214) and H. Pottevin (*ibid.*, 1215). These two investigators, working quite independently, publish simultaneously notes on a peculiar ferment, a diastase, tannase, which has a powerful hydrolysing action in tannin, converting that body into gallic acid and glucose. Fernbach states that Chinese galls invariably contain a little woolly tuft, which, when sown on Raulin's solution, in which the sugar is replaced by tannin, gives rise to a plentiful growth of *Aspergillus niger*, and yields the zymase which acts on tannin. Tannase is precipitated by alcohol, and may be obtained by the Lintner method for the preparation of zymase. Not only do the organised cells reduce tannin, but when an aqueous solution is filtered through a Chamberland filter, the filtrate is as active as the original solution. Since tannase also hydrolyses phenyl and methyl salicylates, its action on tannin points to the correctness of Schiff's constitutional formula for that body, $CH_3(OH)_3.CO.O.C_6H_2(OH)_2COOH$.

It appears to be widely distributed in tannin-bearing plants; Pottevin has isolated it from the leaves of the sumach. It is noteworthy that cultivations of *Aspergillus niger* grown on ordinary saccharine Raulin's solution, are devoid of any action on tannin.

Tecomin; A Colouring Matter from the Wood of Bignonia tecoma. T. H. Lea. (*Journ. Chem. Soc.*, lxxix. 284.) By extracting the sawdust of the wood of *Bignonia tecoma* with alcohol (85 per cent.), and concentrating the alcoholic extract, a plentiful crop of shining chrome-yellow crystals of tecomin was obtained, and a further quantity of the same substance was extracted from the mother liquor by evaporating it to an extract, extracting with ammonia, and liberating the colouring matter with hydrochloric acid. After the removal of the tecomin by means of alcohol, the residual wood yielded another colouring matter to hot dilute caustic soda solution. This is the brown dye which is used by the natives of Brazil to colour cotton fabric, and stain lighter woods. It is applied in the form of a bath composed of shavings and sawdust of the wood with slaked lime and water heated together. Tecomin is but sparingly soluble in alcohol, 85 per cent., and in water. It forms a very delicate indicator for alkalimetry, being sensitive both to acid and alkali. With the former the colour is yellow; with alkali, rose red. It is not affected by weak acids, so it may be used in the cold for titrating carbonates, silicates, sulphites, borates, and cyanides. It is not sensitive to organic acids. With alkalies and mineral acids it is very sensitive, 2 drops of the alcoholic solution diluted to 50 or 70 c.c, giving a sharp colour reaction with 0·2 c.c. of N/100 acid.

Tellurium; Preparation of, in Large Quantities. At a meeting of the Royal Society, E. Mathay (*Chem. News*, lxxxiii. 145) described the recovery of a large quantity of tellurium weighing 26 kilos. from the alkaline residues obtained as by-product in the process of refining bismuth. This amount of tellurium was produced from 321 tons of mineral containing an average amount of 22·50 per cent. of bismuth. The amount of metallic tellurium obtained corresponds to an average of 0·007 per cent. of the original mineral. The 26 kilos. of metallic tellurium was recovered by soaking in hot water the telluride alkalies, resulting from refining the telluric bismuth, acidifying these solutions with hydrochloric acid, and precipitating the tellurium with sodium sulphite. A crude mixture of bismuth and tellurium was thus obtained, the tellurium forming about 47·5 per cent. of the crude

metal. This, dissolved in nitric acid, and again treated in the same way, yielded the amount of tellurium represented by the 26 kilos. This showed on analysis 97·00 per cent. of tellurium. The metal, when broken, shows a crystalline fracture of needle-like structure, and of bright metallic lustre. It does not readily tarnish in the air at the ordinary temperature. If slowly cooled, a crystalline form very much resembling that of bismuth is obtained. Its specific gravity is 6·27, as against 6·23, the density of uncompressed tellurium found by Spring. The temperature of solidification was determined by means of the Le Chatelier pyrometer, and proved to be 450° C., or 5° lower than that given by Carnelley and Williams (*Chem. Soc. Journ.*, xxxvii. 125). Some tellurium prepared from this 26 kilos. to chemical purity also gave 450° C. as the solidifying point. Commercial tellurium obtained from Germany proved to have the same melting point and specific gravity. The electrical resistance is about 800 times that of copper, but appears, however, to be very greatly dependent on the crystalline conditions. A rod cast and cooled quickly has a lower resistance than one that has been cooled slowly. A current of a few ampères will quickly raise the temperature of a rod 0·2 inch in diameter. In casting small rods of tellurium, of, say, $\frac{3}{8}$ inch diameter, there is much contraction, and partial separation takes place even after some hours. The thermo-electric power of tellurium appears to be great.

Terminalia Oliveri; Extract of, as a Substitute for Cutch. D. Hooper. (*Agricultural Ledger*, 1900, viii. 75.) The results of analyses obtained by the author, as well as those in the laboratory of the Imperial Institute in this country, show that, when pure and unadulterated, the extract of the bark of *Terminalia oliveri*, known as "thansha," is of considerable value as a tanning material. The author found the bark to contain more than 25·4 per cent. of tannin, and the leaves 14·5 per cent. A specimen of "thansha" was found to contain over 50 per cent. of tannin, although the extract was soft, containing 25 per cent. of water. As "thansha" has been employed as an adulterant of cutch, and is itself badly prepared, it has fallen into disrepute. It would appear that it should afford a valuable tanning material, since it does not contain any large amount of colouring matter. It would be found a useful application in the manufacture of high class leathers.

Tiliadin. (*Archiv*, ccxxxviii. 555.) W. Braeutigam has isolated a new crystalline neutral body from the bark of *Tilia europea*, tilia-

din, $C_{21}H_{32}O_2$, which occurs in the form of bright odourless and tasteless lamellar crystals, melting at 228 to 229° C. It is removed from the ether extract of the bark by treatment with alcohol, which at the same time dissolves out vanillin. The latter is separated by crystallisation from the alcoholic menstruum, in which it is markedly less soluble than tiliadin. The residue, on concentrating this mother liquor, is again extracted with ether, the ethereal extract concentrated until the impure tiliadin crystallises out, when it is collected and again purified by recrystallisation from alcohol. It is not a glucoside, is insoluble in water, and is not hydrolised by boiling with dilute mineral acids. In addition to these two bodies a crystalline principle, occurring in small needles, has been isolated from the green alga *Pleurococcus vulgaris*, which grows upon the bark. This will be further investigated.

Tin in Preserved Meats. F. Wirthle (*Chem. Zeit.*, xxiv. 263, through *Chem. News*, lxxxii. 309) reports on the examination of several samples of preserved meats of various ages up to 5 years. The metal of the tins contained only 0·21 per cent. of lead, and there was no soldered joint. The amount of tin present was found to increase with the time of preservation, and the meat to contain three times as much tin as the juice. The interior of the boxes were found to be corroded almost solely where there was an accumulation of fat. They were not acted on where they came in contact with gelatin. In 5-year-old tins a white crust was formed which consisted of basic tin chloride, due to the action of the sodium chloride present on the tin. In 4-year-old tins a black layer of sulphide was present. The tin was determined in the meat and juice, by the following modification of Orfila's method. About 120 Gm. of meat (or juices, separated from the meat) was placed in a large porcelain dish of nearly 1 litre capacity, moistened with 5 c.c. of concentrated sulphuric acid, and heated carefully on a sheet of asbestos. It was frequently stirred, and from time to time small quantities of sulphuric acid were added, altogether about 15 to 20 c.c.; the mass was occasionally removed from the sides of the dish, to which it adhered, by means of a porcelain spatula. After four or five hours, a porous carbonaceous mass was thus obtained, which was pulverised and incinerated in a porcelain crucible. The particles adhering to the porcelain dish were transferred to the crucible with the assistance of powdered anhydrous carbonate of soda; a further proportion of carbonate of soda was added, together with a sufficient quantity of nitrate of soda, the whole thoroughly mixed, and heated to gentle

fusion. After cooling, the melted mass was taken up with water, and the cloudy solution obtained submitted to the action of a current of carbonic anhydride. When the cloudy solution had become quite clear (which generally takes place after about twelve hours), the precipitate was collected on a filter, well washed, dried, and incinerated. The ash was treated with a sufficient quantity of potassium cyanide, and the mixture heated to dull redness, the crucible being closed. The melted mass was taken up with warm water, and the metallic tin and the iron collected on a filter, washed, and dissolved in a little warm hydrochloric acid. In the solution, which should not be very acid, the tin was precipitated with sulphuretted hydrogen, the precipitated sulphide was washed with water, saturated with sulphuretted hydrogen, and containing a small quantity of nitrate of ammonium, and then dried, incinerated, and calcined until the weight was constant. The weighed stannic oxide was reduced once more by means of potassium cyanide; the tin thus obtained was dissolved in hydrochloric acid, precipitated in the form of sulphide, and weighed as stannic oxide. The minimum amount of tin found in the meat was 0·0029 per cent., and in the juice 0·0011 per cent. The maximum was 0·016 per cent. in meat, and 0·0036 in the juice.

Tobacco, New Alkaloids of. A. Pictet and A. Rotschy. (*Berichte*, xxxiv. 696.) In addition to nicotine the authors have isolated three other alkaloids from the crude tobacco extract. These are nicoteine, $C_{10}H_{12}N_2$, nicotelline, $C_{10}H_{18}N_2$, and nicotimine, $C_{10}H_{14}N_2$. Ten kilos. of the crude tobacco juice examined contained about 1,000 Gm. of nicotine, 20 Gm. of nicoteine, 5 Gm. of nicotimine, and 1 Gm. of nicotelline. Nicoteine is a colourless oily liquid, boiling at 226° to 267°; it has a parsley-like odour, and an acrid bitter taste in very dilute solutions. It is entirely soluble in water, and has a powerful alkaline reaction. Its optical rotation is $\alpha_D = -46° 14'$. It forms crystalline salts and double salts. Nicotelline is a solid crystalline body occurring in white needles, which melt at 147° to 148° C., and boils at 300° C. without decomposition. Its aqueous solution is not alkaline, nor does it reduce permanganate. Nicotimine is a colourless liquid boiling at 200° to 205° C. It is soluble in water, the solutions being strongly alkaline; its odour is strong and unpleasant. It forms crystalline double salts, the melting point of which distinguishes them from the other tobacco bases.

Tragacanth, Constituents of. C. O'Sullivan. (*Proc. Chem. Soc.*, xvii. 156.) The soluble portion of gum tragacanth consists of

a number of gum acids. These resemble the geddic acids previously described, but differ from them in being lævorotatory. They belong to the series of poly-arabinan-trigalactane-geddic acids, the chief of them being represented by the formula

$$11C_{10}H_{16}O_8.3C_{12}H_{20}O_{10}.C_{23}H_{36}O_{20}.H_2O.$$

This has the rotation $\alpha_D = -88°$.

Bassorin was not obtained perfectly pure; it is of an acid nature, having the rotation $\alpha_D = +98$. When treated with excess of alkali it yields two acids, α- and β-tragacanthan-xylan-bassoric acid. The former, $C_{24}H_{34}O_{20}H_2O$, is soluble in water, and has the rotation $\alpha_D = +138{\cdot}6°$; the latter is insoluble in water, and has the rotation $\alpha_D = +163°–164°$. Both acids, when hydrolised with sulphuric acid, yield the same products, *tragacanthose* and *xylan-bassoric acid*. Tragacanthose is lævorotatory, $\alpha_D = -30°$, and is a pentose. Xylan-bassoric acid is strongly dextrorotatory, $\alpha_D = +200°$. The hydrolysis is represented by the equation

$$C_{24}H_{36}O_{21} + H_2O = \underset{\text{Tragacanthose}}{C_5H_{10}O_5} + \underset{\text{Xylan-bassoric acid.}}{C_{19}H_{28}O_{17}}$$

Xylanbassoric acid is almost insoluble in cold water, but its alkaline salts are soluble; when further hydrolised it yields bassoric acid and xylose, according to the equation

$$C_{19}H_{28}O_{17} + H_2O = C_5H_{10}O_5 + C_{14}H_{20}O_{13}.$$

The last acid is insoluble in water; the optical rotation of its alkaline salts is found to be $\alpha_D = +225°$.

Tungsten Monophosphide. E. Defacqz (*Comptes rend.*, cxxxii. 32) has obtained tungsten monophosphide, WP, in the form of fine, grey, prismatic crystals, by fusing together amorphous WP_2 and copper phosphide at a temperature of about 1200° C. in a blast furnace for 4 hours. On dissolving the fused mass in dilute nitric acid the new phosphide is left insoluble. The crystals have the sp. gr. 8·5 and are stable in the air, but decompose at a red heat into tungstic oxide. They are unaffected by acid or alkaline solutions, but are rapidly decomposed by fusing with nitrates or carbonates.

Tutin, A New Toxic Glucoside. T. H. Easterfield and B. C. Aston (*Journ. Chem. Soc.*, lxxix. 123) have found in the leaves of *Coriaria ruscifolia*, *C. thymifolia* and *C. angustissima*, a new toxic glucoside, tutin, $C_{17}H_{20}O_7$, which crystallises in white needles, commencing to volatilise at 120°–130° C., melting at 208° to 209° C. It is very

soluble in acetone, slightly soluble in $CHCl_3$, and insoluble in C_6H_6 and in CS_2. Its solubility in H_2O is 1·9:100, in ether at 10° C. 1·5:100, and in alcohol at 16° C. 8·2:100. As its formula shows, it differs from coriamyrtin, $C_{15}H_{18}O_5$, the glucoside isolated by Ribau from the European species *Coriaria myrtifolia*, with which it agrees in physiological action, but is much less poisonous.

Turpentine, Bordeaux, Constituents of. A. Tschirch and A. Bruenning. (*Archiv der Pharm.*, ccxxxviii. 630.) The approximate percentage composition of the resin of *Pinus pinaster* (Bordeaux turpentine) is given as: Pimarinic acid, $C_{14}H_{22}O_2$, 6 to 7 per cent.; pimaric acid, $C_{20}H_{30}O_2$, 8 to 10 per cent.; α- and β-pimarolic acids, $C_{18}H_{26}O_2$, 48 to 50 per cent.; volatile oil 20 to 29 per cent., and bordoresene 5 to 6 per cent. Of the above acids pimaric acid alone is crystalline. Pimarinic acid is separated from the ethereal solution of other soda-soluble acids by means of its combination with ammonium carbonate; then pimaric acid is shaken out with solution of sodium carbonate. The two pimarolic acids are separated by the different solubility of their lead salts.

Verbena Oil, French and Spanish. M. Kerschbaum (*Berichte*, xxxii. 885) finds that French and Spanish verbena oil differ very widely in their constituents, the latter containing a ketone, verbenone, which has not been previously isolated, and which is absent from the former. *French Oil of Verbena.*—The oil investigated derived from the Alpes maritimes had the specific gravity 0·903 at 17° C., and the rotation −12° 30′. It contained 26 per cent. of citral and 74 per cent. of terpenes and alcohols. The citral was similar to that of lemon-grass oil, inasmuch as it yielded two semicarbazones with different melting points, derived, as shown by Tiemann, from the two stereochemical forms, "citral A" and "citral B." Verbena oil citral consists mainly of "citral B." *Spanish Verbena Oil.*—This had the sp. gr. 0·926 and the rotation + 2° 45′. It contained only 13 per cent. of citral, and 86 per cent. of terpenes and alcohols, with one per cent. of the new ketone verbenone. This was isolated from the bisulphite compounds after the removal of the citral by means of cyanoacetic acid in alkaline solution. It is a colourless oil, boiling at 103° to 104° C. at 16 mm. pressure, having the sp. gr. 0·974 at 17° C., and the optical rotation + 66°. It has a peculiar camphoraceous or peppermint-like odour. When oxidised with permanganate it yields an acid, crystallising in prisms, melting at 127°–128° C. Verbenone yields a semicarbazone which crystallises in shining lamellæ melting at 208°–209°.

Volumetric Solutions of Sulphuric Acid. R. R. Meude (*Chem. News*, lxxxiii. 172) suggests the electrolytic decomposition of pure cupric sulphate as a means of preparing exact volumetric solutions of sulphuric acid, which do not need to be standardized, except as a matter of precaution. The normal solution is made by dissolving 124·87 Gm. of pure copper sulphate in 800 c.c. of water and passing a current of 2·5 ampères through the solution. A cylinder of copper foil is attached to the negative pole and the anoplatinum rod to the positive pole. The current is allowed to run from 12 to 18 hours. The solution is then made up to 1 litre, in the usual manner. For solutions of other strength it is only necessary to weigh off the corresponding equivalent of cupric sulphate.

Undecylenic Acid, Preparation of, from Castor Oil. H. Thoms and G. Fendler. (*Archiv der Pharm.*, ccxxxix. 1.) Kraft has found that when castor oil is distilled under reduced pressure, a mixture of œnanthol and undecylenic acid is obtained from the decomposition of ricinoleic acid, according to the equation $C_{18}H_{34}O_3 = C_{11}H_{20}O_2 + C_7H_{14}O$. Then the liquid in the retort suddenly becomes viscid and froths. If the heat be then withdrawn, the residue, which has the consistence of caoutchouc, consists of a polymer of $(C_{11}H_{20}O_2)_n$. Thoms finds that this body is the anhydride of tri-undecylenic acid, $C_{33}H_{58}O_5 = (C_{11}H_{20}O_2)_3 - H_2O$. This, when fused with potash, has yielded a new acid having the formula $C_{16}H_{20}O_2$, and melting at 38° C.

Uric Acid, Determination of. A. Bellocq. (*Journ. Pharm. Chim.* [6], xii. 103.) 250 c.c. of the bulked secretion of 24 hours is treated to alkalinity with NaOH solution, the precipitate allowed to subside, the supernatant liquid decanted, and shaken with powdered pumice, 200 c.c. filtered off bright and treated with 20 c.c. of the following reagent: solution of zinc sulphate 1:3, 30 c.c.; solution of soda (sp. gr. 1·332) 30 c.c.; saturated solution of sodium carbonate 40 c.c. If precipitation is not complete, a little more of the reagent should be added. The precipitate then thrown down is collected, transferred to a porcelain and dried. Two c.c. of HCl saturated with uric acid is then added, the capsule floated in cold water, or on a freezing mixture, when the uric acid crystallises out. The crystals are then transferred to a small funnel plugged with a pad of absorbent cotton, drained, washed with 10 c.c. of alcohol, transferred to a filter paper, dried and weighed.

Watara, Volatile Oil of. (*Schimmels' Report*, May 1901, 59.) Methyl cinnamate is now recorded as occurring in this oil, in addition to the two main constituents, dipentene and dextro-

linalool, previously isolated from it. On fractional steam distillation, about 3 per cent. of a high boiling portion was obtained which had a sp. gr. 1·0283, and congealed forming needle-shaped crystals. This body was found to be the methyl ester of cinnamic acid. The original oil had the sp. gr. 0·874, optical rotation +5° 30′ at 20° C., and the refraction index 1·47294.

Wax Analysis. Otto Eichorn (*Zeit. Analyt. Chem.*, xxxix. 640) recommends the use of amylic alcohol instead of ethylic alcohol, as a solvent, in the process of saponifying waxes. To determine the free acid number, about 6 Gm. of wax is heated to boiling with 60 c.c. of pure amyl alcohol, then titrated direct with normal alkali in the ordinary manner. The results thus obtained are distinctly lower than those of the older method. To obtain the total acid number (saponification number) about 6 Gm. of wax is heated on the water bath with 60 c.c. of amylic alcohol and 25 c.c. of normal alcoholic KHO solution. Saponification is complete in 15 minutes, when the amount of unused alkali is determined. The figures thus obtained for the total acid number are markedly higher than those following the use of ethylic alcohol as the solvent.

MATERIA MEDICA.

PART II.

MATERIA MEDICA.

Acetopyrine. (*Merck's Report*, viii. 1900, 46.) Under this name antipyrine aceto-salicylate has been introduced into medicine. It is a whitish crystalline powder with an acetous odour; sparingly soluble in water; melting at 64–65° C. It has been employed with success as an antipyretic and analgesic in acute articular rheumatism, also for the relief of headache and neuralgic pains. It may be given in 8 grain doses six times per diem.

Aceto-salicylic Acid (Aspirine). (*Merck's Report*, viii. 1900, 61.) Aceto-salicylic acid has attracted a considerable amount of attention on the Continent during the past year. It is generally stated to possess valuable antipyretic and analgesic properties, and is considered to be well adapted for use as a substitute for the alkaline salts of salicylic acid. It is prescribed thus: aceto-salicylic acid, 16 grains. To make one powder. Send ten such, three or less to be taken per diem. As an enema thus: aceto-salicylic acid, 150 grains; alcohol q.s.; tepid water, 4 fl. oz.; glycerin, 160 minims.

Adonidine. H. Stern. (*Merck's Report*, viii. 1900, 57.) Although adonidine resembles digitalis in its general action it has the advantage that it may be prescribed in certain cases of heart disease without danger, and of being a powerful and prompt diuretic, more reliable than caffeine, sparteine, strophanthus, digitalis, or nitro-glycerin. The dose varies from $\frac{1}{32}$ to $\frac{1}{6}$ of a grain. It is prescribed thus for diffuse chronic nephritis: adonidine, $\frac{1}{6}$ grain; sodium benzoate, 24 grains. To make one powder, to be taken every four hours in a glass of water. To counteract the toxic effects of nicotine it is given thus combined: adonidine, $\frac{1}{12}$ grain; powdered camphor, $\frac{1}{2}$ grain; ammonium carbonate, $1\frac{1}{2}$ grains. To make one powder. Twenty such doses to be given. In angina it is given in the form of a subcutaneous injection composed of adonidine, $\frac{3}{4}$ grain, dissolved in distilled water 160 minims, 1 to 2 c.c. (16 to 32 minims), to be injected hypodermically.

Adrenalin. T. Maben (*Pharm. Journ.* [4], xii. 361) thus describes adrenalin, the active principle of suprarenal capsules recently isolated by Jokichi Takamine, who has devised a process for isolating it from the gland. The resulting product is in very fine crystals, of a greyish colour. The chemical constitution of adrenalin has not yet been determined, but it is probably alkaloidal. It is exceedingly difficult to dissolve, and it is therefore also sent out in a solution of a strength 1 : 1000, dissolved in normal sodium chloride solution, and containing ½ per cent. of chloretone, the latter having the double function of being preservative as well as locally anæsthetic. The solution has the great advantage of accurate dosage, and may be used internally as a cardiac stimulant instead of the ordinary preparations of the gland. So powerful is adrenalin said to be that a single drop of the solution instilled into the eye will blanch the conjunctivæ, ocular and palpebral, in from thirty seconds to one minute, and with its aid bloodless operations have been performed. If this substance fulfils the expectations raised regarding it, there is no doubt that it will prove a powerful and valuable agent in the hands of those specialists who have already found the suprarenal liquid so serviceable.

Albargin, Gelatose-silver (*Pharm. Zeit.*, xlvi. 1861) is a combination of silver with glutose, analogous to the compounds of the metal with albumins and albumoses. It is prepared by precipitating mixtures of silver salts and glutoses with alcohol, or by evaporating such mixtures to dryness. It is a light yellow powder, readily soluble in water, the solution being neutral in reaction. As in the case of the albumin-silver compounds the behaviour of the metal in combination with glutose towards chemical reagents is altered, and it is not affected by the usual precipitants. It is employed in a 2 per mille aqueous solution, or, where this gives rise to irritation, in a 1 per mille dilution.

Alboferrin. (*Pharm. Post.*, xxxiv. 144.) This new compound of iron with albumin is a light brown powder, odourless, tasteless, and very soluble in water, which has the advantage of not blackening the teeth. It has proved a valuable remedy in anæmia, rachitis, and kindred affections, due to the deficiency of red corpuscles in the blood. It may be taken in the form of powder, tabloids, lozenges with peppermint flavour, or in chocolate, or other beverages.

Aloes, Uganda. J. H. Evans. (*Pharm. Journ.* [4], xi. 573.) A specimen examined differed somewhat from those previously

reported on, containing only a small quantity of aloin. It gave the following reactions :—

	HNO_3 Test.	H_2SO_4 and HNO_3 Vapour.
Uganda aloes	Brownish red	No change.
Barbados ,,	Crimson	Slight bluish green.
Socotrine ,,	Brownish red	No change.
Cape ,,	Brownish red	No change.

Matters Soluble in Water.

Uganda aloes	65 per cent.
Barbados ,,	69 per cent.
Socotrine ,,	42 per cent.
Cape ,,	60 per cent.

Alstonia Constricta and A. Scholaris, Distinction between, and Therapeutic Action of. J. Gordon Sharp (*Pharm. Journ.* [4], xii. 362) finds that true dita bark from *Alstonia scholaris* so far differs in its therapeutic action, and less intensity of bitterness, from *Alstonia constricta*, that the two barks should not be included under the same description as has been done in the B.P. Indian and Colonial Addendum. The dose, too, of the tincture, should not be identical. The official dose of ½ to 1 fluid drachm of the tincture of *Alstonia scholaris* is correct, but for the same preparation of *A. constricta* it should be from 5 to 20 minims. Further, the infusion and tincture prepared by the official directions from true dita, *A. scholaris* are pale in colour, and of a pleasant bitter, while those prepared from *A. constricta* are much darker and have an intensely bitter taste. The two barks are best distinguished by the following chemical tests: (1) If strong H_2SO_4 be applied to the inner layer of *A. scholaris* bark, a bright red colour is soon developed (ditamine test) which, in a very short time, changes to a dirty brown. This is a beautiful test if carefully applied. Should the inner layer happen to be blackened by dirt or age, carefully scrape away the dirt, then apply a drop of clear, pure sulphuric acid to the clean spot. Wait one minute, remove the acid, by drawing the cleansed finger once across the spot, and if the bright red colour has not then developed, it will do so in a very few minutes. (Compare with *A. constricta* bark.) At first the colour often appears in small dots the size of a pin point and then becomes general. *Note.*—The colour soon changes to dirty brown or some dark shade. (2) Strong nitric acid applied to a similar surface gives very soon a yellowish spot (not bright red as in the case of *A. constricta* bark). If some of the nitric acid happens to have run

in between the outer and inner layers, spots of dark blue may be seen. (3) Tincture of iodine gives a black spot (compare with *A. constricta*).

Alstonia constricta bark gives the following reactions: (1) Solution of iodine gives a mahogany brown (compare *dita* bark). If a watery infusion be placed in a porcelain dish and then iodine solution be added thereto and heat applied for ten seconds, a mahogany brown is obtained. On cooling there may be observed on the bottom of the dish, in parts where the watery portion has evaporated, beautiful puce-coloured masses. (2) Strong Fe_2Cl_6, no characteristic reaction. (3) Chromic acid solution, no characteristic reaction. (4) Bromine solution, no characteristic reaction. (5) Strong H_2SO_4, no characteristic reaction. Compare *dita*. (6) Strong HCl, no characteristic reaction. (7) Strong HNO_3, a beautiful garnet red and not so far removed from the so-called blood-red of nux vomica bark. If a watery infusion have added to it a few drops of nitric acid (strong) the same delicate hue results, but soon changes to brownish-green (compare *dita*).

Alstonia scholaris has been found by Hesse to contain three alkaloids, ditamine, $C_{10}H_{19}NO_3$, echitamine and echitenine. The same authority has isolated from *A. constricta* four alkaloids, alstonine $C_{21}H_{20}N_2O_4$, porphyrine, porphyrosine, and alstonidine. The author finds that alstonine has a marked toxic action, in dilute solutions or when mixed with sugar, on infusoria, on insects, and on frogs. He has not yet completed the physiological investigation of ditamine.

Alstonia constricta bark affords a useful tonic, having some of the advantages of both Peruvian bark and nux vomica, without many of their disadvantages. It is particularly useful in influenza, acting on the skin and kidneys, and so aiding the elimination of the toxin.

Aluminium Aceto-tartrate. (*Merck's Report*, viii. 1900, 60.) Under the trade name "Alsol" this compound, in the form of white crystals, freely soluble in water, has been proved to be a reliable and harmless astringent and antiseptic, Aufrecht having found that a 5 per cent. solution is a more powerful germicide than phenol.

Aluminium Caseinate. (*Merck's Report*, viii. 1900, 61.) This organic compound of aluminium occurs as a white tasteless powder, insoluble in water, which has been introduced as an intestinal astringent and disinfectant. It does not derange the digestion The dose is 4 to 5 grains per diem.

Amyl Salicylate. (*L'Union Pharm.*, 1900, 12.) The salicylic ester of amyl alcohol, $C_6H_4.OH.COOC_5H_{11}$, obtained by the action of chlorine on a solution of salicylic acid in amylic alcohol, is recommended by B. Lyonnet as a remedy in rheumatic affections both externally and internally. It forms a colourless liquid, having the sp. g. 1·065 at 15°C., boiling at 250°C. It is practically insoluble in water but is readily soluble in ether, in chloroform, and in alcohol.

Apomorphine as a Hypnotic. Douglas (*Merck's Archiv*, through *Brit. Med. Journ. Epitome*, 1900, 63) points out a fact little known to physicians, that apomorphine acts as a prompt and effective hypnotic if injected subcutaneously in doses of about $\frac{1}{30}$ of a grain, more or less. The dose should be adjusted as to be large enough to produce sleep and small enough to avoid nausea, and this, being only about one-third of the ordinary emetic dose, is quite harmless. In mild insomnia and in furious delirium it was found to produce sleep within twenty-five minutes. The sleep is refreshing and restful, and no disagreeable after-effects follow. If a delirious patient refuses to go to bed, apomorphine will cause him voluntarily to lie down in a few minutes, and sleep will follow. There is no possibility of a "drug habit" being formed, as it becomes a vigorous emetic if the dose be increased. There are no cumulative effects. The small hypnotic doses usually accelerate the heart's action slightly. It was accidentally discovered that it becomes inert if dissolved in a saturated solution of boric acid, the action of the drug, both as a hypnotic and emetic, being then completely neutralised. During four years, apomorphine was given to 300 patients, and the hypnotic effect failed, or was slight, only in two or three cases (idiosyncrasy). In such rare and exceptional cases it was also found that the emetic effect did not follow even large doses.

Arenaria Rubra. (*Merck's Report*, viii. 1900, 95.) Attention is directed to this plant, which is stated to have a beneficial effect on vesical catarrh, dysuria, cystitis, and other bladder affections. It is recommended to be used either in the form of the dry aqueous or liquid extract. The former is rubbed down with sugar and directed to be taken dissolved in water in doses of 30 grains of the extract every three hours. The liquid extract is prescribed in drachm doses in water and glycerin.

Argentol. (*Merck's Report*, viii. 1900, 68.) This combination of silver with oxyquinoline is stated to be a valuable intestinal antiseptic, not acted on by the gastric secretion, readily dissociated

in the alkaline intestinal juice, and very slightly toxic, so that daily doses of 15 grains may be given without risk.

Asterol. (*Merck's Report*, viii. 1900, 71.) Under this name a mixture of mercury paraphenol-sulphonate and ammonium nitrate has been introduced as an antiseptic. Vertun has reported unfavourably upon it, but Karcher and Bentrup find it valuable, the last named stating that it is a valuable substitute for corrosive sublimate.

Bacillol. F. Werner (*Wien. klin. Rund.*, through *Brit. Med. Journ. Epitome*, 1901, 32) claims that bacillol is a perfect antiseptic. It is, he says, freely soluble in water, has a very faint, creosote-like smell, is highly antiseptic, killing anthrax bacilli in one to five minutes in a 1½ per cent. solution, and glanders bacilli in five minutes in a ½ per cent. solution, is quite harmless, possessing neither toxic properties, not exhibiting any harmful or irritant local effect, and is very cheap, being little more than half the price of lysol, and comparing a 1 per cent. solution, which strength he usually employs, with a 1 in 20 solution of carbolic acid, one-tenth of the price of the last named.

Belladonna Root, Phytolacca as an Adulterant of. E. M. Holmes and H. G. Greenish. (*Pharm. Journ.* [4], xii. 591.) A specimen of adulterated belladonna root which contained about 60 per cent. of a foreign root was recently presented to the Museum. This so closely resembled the genuine drug in colour that it was overlooked until, in powdering the root for the manufacture of galenical preparations, it was noticed that the powder gave rise to considerable irritation of the nostrils, which does not occur when belladonna root is powdered. On soaking some of the root in water it was found to differ considerably in structure from belladonna in presenting a series of concentric rings. On comparing the root with that of *Phytolacca decandra* it was found that the two were, so far as could be judged from external characters, identical. *Phytolacca decandra* however is not a native of Europe, but of North America, whilst the adulterated belladonna was imported from Austria to the extent of some hundred-weights. This plant has, however, become naturalised in the South of Europe, and there is another species, *Phytolacca abyssinica*, Hoffm., which is not uncommon on the Riviera, growing, as belladonna does, in shady hedges, where at one time it is said to have been cultivated for the sake of its purplish fruits, the juice of which was used to colour wines. As these drugs are collected by gipsies or peasants, there is always the chance of mistakes happening. The *Phytolacca*, in the size and

shape of its leaves, in its succulent, stout, somewhat forked stem, and its habit of growing in shady places, closely resembles belladonna, and if gathered when not in fruit or flower, might easily be mistaken for that plant.

Poke root is sharply characterised anatomically by the formation of successive separate rings of wood and bast. This is due to the fact that the original cambium, after a short time, ceases to produce new tissue. A secondary cambium forms in the pericycle, and this produces first several rows of parenchymatous tissue on the outer as well as on the inner side, then a circle of isolated bundles of wood and bast. After a short time this cambium also loses its activity, and the growth is continued by a third which, like the second, forms in the pericycle.

From belladonna root it is distinguished by this remarkable abnormal structure, and also by the calcium oxalate, which occurs in acicular instead of sandy crystals. This forms a means by which the powders can be distinguished from one another, or any appreciable admixture of poke root detected in belladonna. The starch of poke root may also be distinguished from that of belladonna when separate, but it would not be easy by this means to detect an admixture, as the latter drug contains in its starch some grains that are almost indistinguishable from the typical grains of poke-root starch.

Bismutose. (*Pharm. Zeit.*, xlvi. 176.) This is a combination of bismuth with albumin containing about 22 per cent. of albuminous bodies. It is a fine, white, odourless and tasteless powder, which becomes a slate grey on exposure to the light. It is insoluble in water, slightly soluble in acid media, but readily dissolved by warm dilute alkalies. Saquer states that it is resistant to the action of the gastric juice, but is rapidly attacked by the pancreatic secretion. It is specially serviceable as an intestinal disinfectant, and externally is used as a dusting powder in various skin affections. It is given in doses of one or two drachms per diem. (*Merck's Report*, viii. 1900, 74). It has proved to be an antiseptic notably valuable in infantile diarrhœa. From its practical freedom from toxicity it may be dispensed as a simple powder, with the following dosage: for infants, 1 saltspoonful several times a day; for older children, from ½ to 1 teaspoonful 3 or 4 times daily; for adults a larger quantity, in soup or other vehicle.

Bromalin. (*Merck's Report*, viii. 1900, 75.) This compound, hexamethylene-tetramine-bromethylate, was introduced some time

back as a means of administering bromine in epilepsy. Although it cannot replace bromides, when prescribed with the alkaline salts it greatly increases their power, so that the maximum therapeutic effect is attained with a dose which does not produce bromism.

Bromocol. H. Brat. (*Therap. Monats.*, xv. 186.) Bromocol is obtained by precipitating a solution of bromo-tannin with gelatin. Thus obtained it contains 20 per cent. of bromine and 30 per cent. of gelatin, probably in the form of a di-bromotannin gelatin. It is stated to be a valuable substitute for alkaline bromides, since it may be given in large doses of 15 to 75 grains per diem without producing bromism. It is also superior to bromeigon and bromalbacid, in that it is not decomposed by the gastric juice but is only split up on contact with the alkaline intestinal secretion. It occurs as an odourless and tasteless powder, which is best administered in cachets each containing seven and a half grains.

Cacodylic Acid and Cacodylates. W. Harrison Martindale. (*Pharm. Journ.* [4], xi. 724.) The communication is a useful, critical summary of chemical and therapeutic literature of the medical and pharmaceutical applications of cacodylic acid and its salts, which should be referred to in the original publication.

Calcinol. W. Mackie. (*Lancet*, clix. 1867.) Under this name calcium iodate has been introduced as an antiseptic and general substitute for iodoform. It is prepared by treating a solution of iodine in potassium iodide of such strength that it will just allow light to pass through a depth of three inches, with a filtered solution of bleaching powder. If the crystals which form after occasional agitation and standing for some time be not quite white, a further quantity of potassium iodide solution is added, and the mixture treated with more solution of chlorinated lime, until the colour of the free iodine is discharged. The precipitate is then freed from any calcium carbonate by treatment with very dilute hydrochloric acid, collected, washed with water, and dried at a temperature not exceeding 100° C. The salt has the formula $Ca(IO_3)_2 6H_2O$. It is odourless and tasteless, soluble in 380 parts of water at 11·5° C. The dose, internally, as an intestinal disinfectant, is 2 grains 3 times daily in solution.

Calcium Glycero-Arsenate.—Pagel. (*Journ. Pharm. Chim.*, [6], xiii. 449.) Salts of glycero-arsenic acid are suggested as a favourable means of administering arsenic, resembling, in this respect, the analogous glycerophosphates which have been extensively used on the Continent as nutritive tonics. Glycero-

arsenates are precisely analogous to the glycerophosphates, arsenic acid replacing phosphoric acid in the molecule. Calcium glycero-arsenate is obtained by the process of Prunier for the preparation of lime glycerophosphate. Suitable proportions of glycerin and arsenic acid are heated together for several days until finally the mass becomes slightly brown. It is then diluted with an equal volume of water and neutralized with milk of lime. After filtration the lime salt is precipitated by the addition of alcohol, the precipitate is collected and washed, first with several portions of alcohol, and finally with ether. The product, when dry, is a gritty powder, insoluble in water and in alcohol, but readily dissolved in acid liquids, notably in weak solution of citric acid. Arsenic cannot be detected by the ordinary reagents which precipitate it until the molecule has been completely broken up. Spillmann is experimenting on the therapeutic properties of the salt. So far, it has given very satisfactory results in tuberculous cases, its administration being followed by a marked gain in weight and general improvement of the health of the patient. It has been given in the form of granules commencing with doses of 1½ grains per diem, gradually increased until the patients were taking 23 grains without showing any ill effects. The salt is very rapidly eliminated by the kidneys.

Calcium Eosolate. (*Merck's Report*, viii. 1900, 78.) The calcium salt of trisulpho-acetyl-creosote is stated by Stern to be a valuable remedy in diabetes. It is a greyish white powder soluble in 8 to 10 parts of water. The dose is from 4 to 10 grains three or four times daily in cachets.

Cascara Bark, Powdered, Adulteration of, with Rhamnus Frangula. Em. Perrot. (*Journ. Pharm. Chim.* [6], xiii. 161.) On the Continent, commercial powdered cascara bark is frequently met with adulterated with the bark of *Rhamnus frangula.* The admixture may be detected by moistening the powder with solution of chlorinated lime; the parenchymatous elements of cascara are thereby coloured yellow, while those of *R. frangula* are tinted a deep red. Examination *sub lente* after this treatment renders detection of the admixture easy. Drawings are given of the histological elements of the two barks in the form of powder, and attention is directed to the fact that the sclerogenous cells of cascara are distinctive. *Rhamnus frangula*, moreover, shows numerous collenchymatous and cork cells which are impregnated with a red brown tannin. These are not found in cascara. Although, from the different market value of the two barks, the

admixture must be considered grossly fraudulent, it is not, in the author's opinion, very serious from a medicinal point of view, since buckthorn bark is at least equal to that of *Rhamnus purshianus* in therapeutic activity. It is suggested that *Rhamnus frangula* bark might usefully replace the bark of *Rhamnus purshianus.*

Capsicums, Egyptian. (*Chem. and Drugg.*, lviii. 607.) A fine sample of Egyptian capsicums have lately (April, 1901) made their appearance on the market. The pods are of a bright, uniform colour, devoid of the calyx and stalk, are very clean, and have evidently been carefully prepared. They are valued at about 65*s.* per cwt. No data bearing upon this sample are available, but by careful comparison with Natal capsicums, the two forms are practically indistinguishable, and it is probable that the sample in question has been grown from Natal seed. In the early part of May last year, one of the Mincing Lane brokers included in his spice-catalogue a similar sample from the same country, equally well prepared, and valued at the time at 83*s.* per cwt., fine Natal being worth 90*s.* In the catalogue referred to, a sample of chillies from the same source was also included, but no further parcels appear to have been offered since, though occasionally quantities from Nyassaland are met with. It is just possible that at no distant date both capsicums and chillies may be received from the West Indies, as seeds of the commercial varieties were freely distributed through these islands, some time since, by Dr. D. Morris, late assistant director of Kew Gardens.

Cassia Montana. A Spurious Senna. E. M. Holmes. (*Pharm. Journ.* [4], xii. 646.) Upon two occasions during May, 1901, parcels of spurious senna, identified as the leaflets of *Cassia montana*, have been offered in the London drug market. The distinctive features of the spurious senna are: the obtuse or rounded ends of the leaflets, the obtuse angles of the lateral veins, the presence of a well-marked dark network of veins on the under surface, and the presence of a distinct mucro, or the broken end of one, at the apex of the leaflets. The presence of the scars on the rachis also affords evidence, since there are only 6 to 8 pairs of leaflets on Tinnevelly senna leaves, but 10 to 15 on those of *Cassia montana.*

The paper is accompanied by drawings of the distinctive parts.

Cassia Montana, Histology of. H. G. Greenish. (*Pharm. Journ.* [4], xii. 694.) The leaves of *Cassia montana* having, as shown above, been recently offered as senna, the histological

characters are described. A drawing of the structure of the leaflet is given. Since the leaves might possibly be fraudulently used as a substitute for the genuine drug in the form of powder, the following characters are also given of the leaf in that condition. The powder of the leaves exhibits well-marked characters. Hairs are entirely absent, and fragments of the upper epidermis free from stomata can be found. Most distinctive, however, is the abundance of small rosettes of calcium oxalate; they appear thickly scattered over the whole field, for they are visible both in the numerous fragments that exhibit the section of the leaf and in the fragments that present a surface view. These crystals, taken in conjunction with the pluricellular palisade tissue, afford information of great diagnostic value; the oil globules, which are very numerous in the palisade tissue of some leaves, are not of such high importance. Many fragments of the pericyclic fibres may be found; these may be identified by their thin walls and rows of crystal-cells. The mucilage in the powder may be rendered easily visible by appropriate stains.

Cinnamon Adulterated with Guava Bark. (*Oester. Zeits. für Pharm.*, liv. 713.) The bark of *Psidium guajava* is stated to be used as a fraudulent substitute for, or as an admixture with, true cinnamon bark. As this adulterant is practically odourless the bark is soaked in cinnamon water, dried and both ends of the quill touched with a little cinnamon oil to give the required aroma.

Cinnamo-Cacodylic Acid. A. Astruc and H. Murco. (*Journ. Pharm. Chim.* [6], xii. 555.) By combining molecular proportions of cacodylic and cinnamic acids a compound having the formula $C_6H_5-CH:CH\cdot COOH$, $As(CH_3)_2OH$ has been obtained in the form of white prisms which melt at 79–81° C. It is dissociated by water, but is soluble in alcohol, and sparingly soluble in ether, glycerin, and oils. It is suggested that it may find useful application in the treatment of tuberculosis, for which purpose it should be given in the form of pills.

Cinnamon in Influenza. J. C. Ross. (*Brit. Med. Journ.*, 2110. 1402.) Prolonged experience in the treatment of influenza with cinnamon has shown it to be one of the most valuable remedies for that complaint. The treatment should be commenced as soon as possible after the onset of the attack. The drug may be conveniently administered in the tabloid form, two tabloids being taken every half-hour for the first two or three hours, and after the temperature has fallen, two tabloids every four hours should be continued for four days.

Coca Leaves, Commercial, Botanical Source of. E. M. Holmes. (*Pharm. Journ.* [4], xii. 3 and 81.) A complete summary is given of the opinions of various botanists, accompanied by reproductions of drawings which have appeared, one of which having been incorrectly named, has added confusion to the already intricate question of the species and nomenclature of the plants yielding commercial coca leaves. The paper, not lending itself to condensation, should be perused in the original.

Colocynth, and Colocynth powder, the Ash and Microscopical Character of. H. G. Greenish (*Pharm. Journ.* [4], xii. 398) gives the ash content of the various commercial colocynths in the pulp, seeds and the commercial powder. *Percentage of ash in colocynth pulp:* (1) Spanish, 11·57; (2) Spanish, 9·66; (3) Turkey, 10·27; (4) Spanish, 11·31; (5) Turkey (2nd qual.), 8·62; (6) Turkey (fine), 9·92; (7) Turkey (fine), 13·43. *Percentage of ash in colocynth seeds:* (1) *a*, Ripe, 2·56; *b*, Unripe, 5·37; (2) *a*, Ripe, 2·26; *b*, Unripe, 4·56; (3) 2·79; (4) 2·15; (5) 3·19; (6) 2·74; (7) 2·45. *Percentage of ash in commercial powdered colocynth:* (1) Pulp, 8·73; (2) Pulp, 11·48; (3) Pulp, 11·39; (4) Fruit, 5·04; (5) Fruit, 7·03.

As in some of the samples of fruits many of the seeds were loose, it was not possible to arrive at any accurate estimation of the ash yielded by the entire fruit. Assuming however that the fruits consist on the average of 75 per cent. of seed and 25 per cent. of pulp, an assumption that is sufficiently near the truth for the present purpose, the following approximate figures for the ash of the entire fruits are obtained by calculation: *Approximate percentage of ash in entire fruits:* (1) Fruit, 5·86; (2) Fruit, 4·97; (3) Fruit, 4·66; (4) Fruit, 4·43; (5) Fruit, 4·55; (6) Fruit, 4·53; (7) Fruit, 4·94.

It is suggested that the following description should be appended to the official monograph:—

The powdered drug consists of the débris of large thin-walled parenchymatous cells, with occasional small vascular bundles. It should be free from starch, and should not contain more than an occasional sclerenchymatous cell or group of such cells.

Copaiba. By J. C. Umney and C. T. Bennett. (*Pharm. Journ.* [4], xii. 324.) The South American varieties met with in commerce are classified or commercially described by the names of the ports from which they are shipped, the principal being the following: Bahia, Cartagena, Maracaibo, Maranham, Pará and less frequently Cayenne and Angostura. Flueckiger and Hanbury (*Pharmacographia*, p. 201) give descriptions of various *Copaifera*, and al-

though it is not possible to say with accuracy the species from which each variety is derived, the following appear to be the most likely: Bahia, *Copaifera coriacea*; Cartagena, *Copaifera officinalis*; Maracaibo, *Copaifera officinalis*; Maranham, *Copaifera lansdorffii*; Pará, *Copaifera multijuga*; Cayenne, *Copaifera guianensis.*

The species referred to specifically in the various Pharmacopœias are the following: Brit. Pharm., 1885, *Copaifera lansdorffii* and other species; Brit. Pharm., 1898, *Copaifera lansdorffii* and other species; United States Pharm., *Copaifera lansdorffii* and other species; Pharmacopœia Germanica III, *Copaifera officinalis* and *C. guianensis*; German Pharmacopœia IV, *C. officinalis*, *C. guianensis*, and *C. coriacea*; French Codex, *C. officinalis*, *C. guianensis*, *C. coriacea*, *C. lansdorffii.*

Characters and Tests for Copaiba in Various Pharmacopœias. There are important differences between the requirements of the present Pharmacopœia and those of the 1885 edition, the most noticeable being in the range of specific gravity, extended from "0·940 to 0·993" to "from 0·916 to 0·995."

The United States Pharmacopœia, 1890, has a narrower range of specific gravity, namely "0·940 to 0·990," and includes in addition to ordinary solubility tests, a requirement that the oleoresin shall yield a transparent mixture with one third of its volume of ammonia water (10 per cent.). The German Pharmacopœia (III) had a range of specific gravity of 0·960 to 0·990, but this has been restricted in the recently published fourth edition to the limits 0·980 to 0·990. How then do the commercial varieties referred to correspond first of all with the British Pharmacopœia 1898 requirements? The following table recorded examination of specially selected type samples affords an answer:—

Name of Variety.	Specific Gravity.	Percentage of Oil.	Character of Resin.	Other Characteristics.
Bahia . . .	0·938	49·7	Soft.	Answer solubility and Gurjun Balsam tests.
Cartagena . .	0·970	41·3	Brittle.	,,
Maracaibo . .	0·969	42·5	Firm, but not easily pulverized.	,,
Maranham .	0·990	41·8	Brittle.	,,
Pará . . .	0·920	62·4	Very soft.	,,

It is seen therefore that all these samples practically respond to the requirements of the British Pharmacopœia, 1898, with the two slight exceptions—(*a*) Character of the resin; (*b*) Rotation of essential oil.

Character of Resin. Many of the samples examined during the past few years, similar to some of those which are included as types in this table, do not yield residues after heating for forty-eight hours at the temperature of a water bath until apparently all "volatile oil is removed"—"that are easily rubbed to powder." This is in accordance with the experience of Kebler (*American Journal of Pharmacy*, 1897, p. 579), and it appears not to indicate presence of fixed oil, as the B. P. states, but a difference in the character of the resin, probably in the ratio of hard and soft resins.

How do these different commercial varieties correspond with or differ from the requirements of the United States Pharmacopœia? In sp. gr. alone it is obvious that the Bahia and Pará varieties are placed out of court, whilst with the ammonia test already referred to the following result is obtained:—

Variety.	U.S.P. Test Shaken with one-third volume of Ammonia Water (10 per cent.).
Bahia	Turbid
Cartagena	Clear
Maracaibo	Clear
Maranham	Clear
Pará	Turbid

In connexion with the new German Pharmacopœia tests it is necessary to record the acid, ester and saponification numbers, the requirements being that the acid number should fall between 75·6 and 84, and the ester number be not more than 8·4.

The following table gives the acid, ester and saponification numbers of type samples of different varieties:—

Variety.	Acid No.	Ester No.	Saponification No.
Maranham	81·5	12·8	94·3
Cartagena	56·0	28·0	84·0
Maracaibo	50·2	12·1	62·3
Bahia	33·7	15·3	49·0
Pará	33·1	26·9	60·0

In order to include the varieties of copaiba at present met with in commerce the authors suggest that the monograph on oleoresin of copaiba should be revised. They also indicate that it would be well to include, separately, both the oil and the resin, since medical opinion seems to incline to the view that either one of these constituents may be frequently prescribed with advantage.

Suggested description of the oleoresin.

The oleoresin obtained from the trunk of various species of *Copaifera.*

Characters.—A more or less viscid liquid, generally transparent, and occasionally fluorescent; yellow to golden brown in colour, having a peculiar aromatic odour, and a persistent acrid somewhat bitter taste.

Tests.—Specific gravity, 0·975 to 0·995. Entirely soluble in absolute alcohol, and in four times its bulk of petroleum spirit, the latter solution yielding only a slight filmy deposit on standing. It should evolve no odour of turpentine when heated, and should not lose more than 45 per cent. when dried at the temperature of a water bath for forty-eight hours. A transparent solution should be formed when mixed with one third of its volume of solution of ammonia (10 per. cent.). The volatile oil should rotate the plane of a ray of polarized light from 7° to 21° to the left in a 100 mm. tube, and should not boil under 250° C. (absence of African copaiba). Four drops carefully added to a mixture of half an ounce of glacial acetic acid with four drops of nitric acid should not afford a purplish-red or violet colour (absence of gurjun balsam). One gramme dissolved in 50 c.c. of absolute alcohol should require at least 2·7 c.c. of semi-normal alcoholic potash for neutralization, using phenol-phthalein as an indicator (presence of a sufficient proportion of acid resins).

Volatile Oil. The oils distilled from the different commercial varieties examined all answer the requirements of the British Pharmacopœia, 1898, with the exception of the optical rotation. The limits recorded for optical rotation of the oil in the monograph of copaiba itself are a mistake, and based upon an incorrect abstraction of a paper on African copaiba by one of the authors (*Pharm. Journal*, September 9, 1893, p. 216).

No differences can be determined in the composition of the oils as indicated by the following characters, which might be officialized :—

Specific gravity at 15° C.	0·903 to 0·908
Optical rotation in a tube of 100 mm.	−7° to −21°
Range of boiling point	245° C. to 275° C.
Solubility in absolute alcohol	1 in 1

Resin. The authors are of opinion that the determination of acid and saponification numbers, and deduction from these figures of ester numbers—the method of examination already referred to, and suggested by Dieterich—is of really little value in oleoresin containing varying proportions of volatile oil and resin, although it would be in copaiba having the restricted physical characters of the German Pharmacopœia. The acid and saponification numbers of the resins freed from essential oils indicate certain marked differences.

The following table includes the acid and saponification numbers of the resins obtained after dissipation of essential oil :—

Variety.	Acid No.	Ester No.	Saponification No.
Maranham	136·3	36·7	173·0
Cartagena	135·7	45·1	180·8
Maracaibo	80·3	49·9	130·2
Bahia	73·1	73·0	146·1
Pará	68·9	87·2	156·1

In their opinion the following characters for copaiba resin could be made official :—

Copaiba Resin.—The residue obtained from copaiba after the removal of the volatile oil. A hard brittle amorphous substance having a yellowish, yellowish-brown or reddish-brown colour and an acrid taste. Soluble in alcohol, ether and carbon disulphide, the solution having an acid reaction. 1 Gm. dissolved in 50 c.c. of absolute alcohol should require for neutralization at least 4·3 c.c. of semi-normal alcoholic potash, using phenol-phthalein as an indicator.

Dymal. (*Nouv. Rem.*, xvii. 173.) This is an antiseptic, dymin salicylate, employed as a dusting powder, or combined in the form of an ointment, for wounds. It has a marked desiccating action as well as being a powerful antiseptic. Kopp has found it of special value in the treatment of burns. It is perfectly non-irritant, and free from toxicity. It has given good results in eczema, both chronic and acute, and in other skin diseases.

Eigones. B. Mindes (*Pharm. Post*, xxxiv. 2) thus describes the properties of the various compounds of albumin with iodine and bromine, which have been introduced into medicine under the name of eigones. *Iodeigone*, or iodised albumin, is an almost odourless and tasteless brown powder, insoluble in water, and containing 20 per cent. of iodine in a state of intimate combination. In small doses, the iodeigones are claimed to be efficient substitutes for thyroiodine; in larger, doses they may replace the alkaline iodines, without giving rise to the secondary effects of those salts. *Sodium-iodeigone* occurs as a nearly tasteless and odourless powder, containing 1 per cent. of iodine combined with the albumin and not with the alkali. It is fairly soluble in cold water, more so in warm. The solutions are neutral. It is obtained, according to Dieterich, by heating iodeigone with caustic soda solution. *Pepto-iodeigone*, or iodised peptone, is similar to the above, but more readily assimilable. These bodies are given internally in doses of 3 to 30 grains three times per diem. Externally they may be used as dusting powders in place of iodoform. *Bromeigone* is a combination of albumin with bromine obtained by the action of bromine, or of ethyl bromide. It is a white insoluble powder, containing 11 per cent. of bromine. *Pepto-bromeigone* is the above compound peptonised. It is soluble in water, and contains 10 per cent. of bromine. Both are given as substitutes for the alkaline bromides in daily doses of 150 to 300 grs., in cases of epilepsy and nervous diseases. Mixed with iodeigone they are used as antiseptic healing dressings.

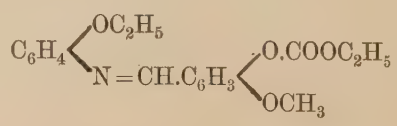
Epigea Repens in Urinary Disorders. Rothrock (*Wisconsin Medical Recorder*, through *Western Druggist*, xxiii. 75) recommends *Epigea repens* for a variety of urinary disorders. Its action is similar to that of uva ursi and buchu, but, in his hands, it has given better results. In cystitis he uses 20 to 30 drops of the tincture every three hours, until a positive effect is produced. In chronic muco-cystitis it is extremely valuable, and may be alternated with fluid extract of rhus aromaticus, 20 drops every three hours, or they may be given together, combined in equal volumes, 30 to 40 drops being given every three hours as indicated. The remedy is also recommended in suppression of the urine, inflammation of the urethra, and oxalic acid deposits. It acts promptly in diabetes mellitus, alternated with the rhus aromaticus. It is also useful in chronic Bright's disease.

Ergotin in Pneumonia. (*B. M. J. Epit.*, 1900, 137.) At the thir-

teenth International Medical Congress at Paris, Kleczkowski stated that ergotin employed in a daily dose of 46 to 68 grains from the period of rigour, before the appearance of bronchial breathing, had the effect of making the disease go through its evolution in four or five days. Given later it does not appreciably shorten the duration of the febrile stage; but it moderates the fever, relieves the dyspnœa, and calms the delirium, which never resists its action more than twenty-four hours. Kleczkowski has used this treatment for eighteen years, and in all that period has never seen a single fatal case of pneumonia except in diabetic subjects.

Eugoform. H. Maass (*Deut. Med. Woch.*, 2111, 96, through *Brit. Med. Journ. Epit.*) reports on a new drug called eugoform. It is a fine, almost odourless, greyish white powder, and is prepared by the action of formaldehyde on guaiacol, and subsequent acetylisation. He finds that, as a dusting powder for wounds in children, and especially in those cases where there is much risk of the contaminating effect of urine, fæces, etc., and when there is a tendency to local eczema around the wound, it is of considerable value. It has a certain local anæsthetic action, which he considers a great advantage for the type of cases mentioned. For scrofulous wounds, after opening of cold abscesses, etc., and for wounds after removal of glands or after bone operations, he had less good results with it; he prefers to treat the exuberant granulations with tincture of iodine. The price of eugoform is about the same as that of iodoform, but since less is required of the former, it can be considered to be less expensive.

Eupyrine. Oberlach (*Centr. f. inn. Med.*, through *Brit. Med. Journ. Epit.*, 1901, 31.) recommends eupyrine as a stimulating antipyretic. It is a chemical compound of the ethylcarbonate of vanillin and paraphenetidine, and occurs as pale greenish yellow, tasteless crystals having a faint odour of vanilla. It is readily soluble in alcohol, ether, and chloroform, but with difficulty in water. Its structural formula is—



Experiments on dogs showed that it caused no dangerous symp-

toms even in enormous doses, and after twenty times the dose required for man, methæmoglobin was scarcely discoverable in the blood spectroscopically. In more than fifty cases of pyrexia in man it never produced any unpleasant symptoms, and reduced the temperature to normal on an average within three hours. About 23 grs. is usually a sufficient dose, though larger doses, such as over 1 ounce, are quite harmless. As a stimulating antipyretic it is far superior to phenacetin in pyrexia likely to be accompanied by collapse, and therefore in such diseases as influenza and typhoid fever, especially in children or old people. The stimulating property is due to vanillin. It produces profuse diaphoresis. In the treatment of neuralgia, eupyrine is inferior to many other drugs it is simply a safe antipyretic and diaphoretic.

Fennel Seeds, Adulterated. Juckenach, R. Senelter, Wender, and G. Greyer (*Oester. Zeitsch. für Pharm.*, xxxviii. 593), have all called attention to the prevalence, on the Continent, of adulterated fennel seeds. The material used for the sophistication is the exhausted fruits, of which three kinds are met with. The first are small distorted dark brown fruits which contain but little oil. These are of the lowest value. They are produced by distilling the seeds in a current of steam under pressure. Next in value come the fruits deprived of oil by distillation while suspended in water. The highest priced adulterant is the residual fennel of the compound spirit and hollands distilleries, fruits partially exhausted by maceration in alcohol. These latter have a peculiar odour. To imitate this the odourless and cheaper sorts of the second kind are sprinkled with fousel oil. This is therefore a case of adulterating an adulterant. The fruits are tinted with various dyes, which generally may be detected by rubbing the sample through the hands when the dye will colour the skin. The presence of the exhausted fruits may be detected by macerating in water, or more rapidly, in alcohol, when pure fruits retain their colour almost unaltered, but in exhausted fennel the pericarps develop a dark brown tint between the ridges, and the surrounding liquid is, at the same time, coloured.

Ferratogen. (*Merck's Report*, 1900, viii. 99.) Ferratogen is an iron nuclein compound, obtained from yeast cultivated in a ferruginous medium. From experiments on dogs, Cloetta finds that from 37 to 56 per cent. of the iron given in this form is absorbed. It is put forward as a suitable means of administering iron in the treat-

ment of anæmia, in those cases in which the usual methods of giving the metal cause digestive derangements.

Ferripyrine. (*Merck's Report*, 1900, viii. 100.) In addition to its use as a styptic in gynæcology, Pewnizki finds that it is useful as an instillation, in the form of a 1 to 20 per cent. solution, in certain ear affections. Although it is not a powerful antiseptic, it forms a coagulum in the inner passages of the ear, and exercises an absorptive action on the hyperplastic processes of the mucous membrane.

Fersan. Silberstein (*Therap. Monats.*, through *Brit. Med. Journ. Epit.*, ii. 1901, 20) gives the following details of his own experiments, and summarises the results of others with this new iron compound. Fersan is produced by centrifugalising whipped blood and treating the separated red blood corpuscles with concentrated hydrochloric acid. There are thus formed a histon-like base and an acid-albumin containing all the iron and phosphorus. It is a chocolate-like powder with a slightly salt taste, perfectly soluble in warm water and not coagulated on heating; it contains more than 80 per cent. of proteid and is absolutely free from alloxan bases and other products of proteid katabolism. Winkler showed that its administration to animals caused an increased deposition of iron in the liver and spleen, and Kornauth proved its inhibitive value by giving it to healthy men. Silberstein has used it in cases of anæmia in primary and tertiary syphilis, of severe early syphilis, and of anæmia following uterine hæmorrhage, also as a nutritive agent in children convalescent from acute specifics. He reports that the results obtained were uniformly good. As fersan is not acted on by artificial gastric juice it is probably absorbed only from the intestine, and that the absorption is very complete is shown by the fact that the fæces are not coloured by ferric chloride as after the administration of other iron salts. The adult dose is 3 to 6 teaspoonfuls a day, but 3 ounces a day have been given to a man for some weeks without ill-effect. The author lays great stress on the entire absence of all secondary consequences, which are so frequent a drawback with other iron preparations.

Ginger, Commercial. (*Pharm. Journ.* [4], xii. 522.) A. Russell Bennet finds that the various commercial varieties of ginger at present on the market give the following figures.

Jamaica Ginger Whole.

No.	Colour.	Total Ash	Sol. Ash.	Insol. Ash.	Moisture.	Cold Water Extract.	Approx. Volatile Oil.	Ether Extract.	Alcohol after Ether	Resin Extract.
1	Pale buff . .	3·45	2·04	1·41	13·47	13·19	0·7	3·63	3·14	5·61
2	Pale buff . .	3·61	1·93	1·68	11·16	14·31	0·2	3·19	4·18	5·40
3	Pale buff . .	3·21	2·13	1·08	12·39	12·21	0·4	3·41	3·09	4·91
4	Buff . . .	3·30	2·09	1·21	10·43	13·18	0·3	2·57	4·15	3·94
5	Buff . . .	3·19	2·13	1·06	11·19	12·53	0·4	3·91	5·16	5·19
6	Very pale buff .	3·29	1·99	1·30	10·17	13·47	0·9	3·81	4·18	4·98
7	Coated . . .	4·15	2·16	1·99	10·61	9·43	0·4	6·41	3·41	4·80
8	Very pale buff .	3·18	2·13	1·05	11·71	11·19	0·7	3·71	3·87	5·16
9	Coated . . .	4·31	1·93	2·38	10·83	8·91	0·3	5·69	4·21	4·10
10	Pale buff . .	3·61	1·89	1·72	11·91	14·73	0·5	4·31	3·87	5·31
11	Very pale buff .	3·19	1·91	1·28	11·46	13·61	0·6	3·19	4·19	4·91
12	Pale buff . .	3·14	2·13	1·01	12·31	15·19	0·4	4·14	3·17	4·96

Jamaica Ginger Ground.

No.	Colour.	Ash.	Sol. Ash.	Insol. Ash.	Moisture.	Cold Water Extract.	Approx. Volatile Oil.	Ether Extract.	Alcohol after Ether.	Resin Extract.
1	Very pale buff .	2·68	2·10	0·48	13·41	13·01	0·8	3·42	3·31	4·81
2	Ditto . . .	3·46	2·91	0·55	12·09	12·16	0·4	3·69	3·42	5·00
3	Light brown . .	3·19	2·84	0·35	10·16	15·01	1·2	2·97	3·01	5·01
4	Very pale buff .	3·47	2·19	0·28	11·17	12·19	0·9	3·16	3·13	4·97
5	Coarse fibre and pale buff . .	1·39	1·24	0·15	14·16	8·49	0·6	3·46	3·31	3·51
6	Fibrous light brown	2·99	1·01	0·98	15·01	7·01	0·7	4·12	4·01	4·67
7	Pale buff . .	3·16	1·74	1·42	11·19	13·65	0·5	4·11	3·96	5·67
8	Buff . . .	2·01	1·50	0·51	13·41	7·81	0·8	3·96	3·49	2·76
9	Pale buff . .	2·86	1·11	1·75	13·16	7·17	0·5	4·10	3·90	4·91
10	Very pale buff .	2·14	1·51	0·63	12·19	7·24	0·5	4·21	4·16	3·41
11	Pale buff . .	3·20	1·09	2·11	12·86	7·16	0·8	3·61	3·01	5·26
12	Ditto . . .	2·71	1·42	1·29	13·41	8·41	0·7	4·60	3·91	3·51

No. 5 is a very poor specimen of ginger, and falls below the standard proportionately in cold water extract as well as in soluble ash. It will be observed that the yield of resin extract is very uniform throughout.

From the foregoing results it appears that the percentage of matter extracted by ether, or the spirit extract after ether, affords very little information, and any estimate based on these data must be of a very rough kind.

On the other hand the proportion of extractive matter yielded to cold water seemed to give very favourable results, because the amounts dissolved in most cases were in proportion to the amount of soluble ash.

Cochin Ginger Whole.

No.	Colour.	Ash.	Sol. Ash.	Insol. Ash.	Cold Water Extract.	Resin Extract.	Moisture.
1	Very pale buff	3·56	2·01	1·55	13·23	6·41	12·41
2	Pale buff . .	3·41	1·94	1·47	12·19	5·95	11·98
3	Buff	2·96	1·07	1·89	6·59	4·91	12·16
4	Scraped. . .	3·47	2·02	1·45	14·01	6·51	13·04
5	Coated . . .	4·21	3·02	1·19	11·46	6·74	10·98
6	Coated . . .	3·29	2·17	1·12	10·97	6·41	12·79
7	Coated . . .	3·56	1·97	1·59	13·01	5·12	11·74
8	Pale buff . .	3·17	1·56	1·61	8·31	6·42	10·09
9	Pale buff . .	2·96	1·05	1·91	6·41	5·91	11·12

No. 3 would almost seem to have been used in the whole condition for making essence judging from its very low standard of soluble ash and cold water extract. Nos. 8 and 9 bear a similar resemblance.

Cochin Ground.

No.	Colour.	Total Ash.	Sol. Ash.	Insol. Ash.	Cold Water Extract.	Resin Extract.	Moisture.
1	Buff	3·61	2·40	1·21	10·13	6·51	13·6
2	Buff	2·14	0·7	2·07	7·21	5·96	12·01
3	Light buff fibrous . . .	2·01	0·5	1·96	6·95	5·71	11·19
4	Buff	3·75	2·51	1·24	8·94	5·61	12·16
5	Pale buff . .	3·85	2·45	1·40	11·45	6·49	13·13
6	Buff	2·96	2·06	0·90	12·19	6·41	10·19
7	Very pale buff	3·19	2·39	0·80	11·14	5·91	13·14
8	Very pale buff	4·16	2·11	2·05	12 12	5·41	12·26
9	——	2·06	0·3	2·03	10·13	5·41	13·09

It will be observed that the lowest total ash is 2·01, and that its soluble ash is in proportion to its low cold water extract. Nos. 2, 3, and 9 are evidently the usual specimens of sophisticated ginger sold by small shopkeepers. It is a remarkable fact that all the resin extracts are above 5 per cent.

AFRICAN WHOLE.

No.	Colour.	Total Ash.	Sol. Ash.	Insol. Ash.	Cold Water Extract.	Resin Extract.	Moisture.
1	Dark brown .	3·41	2·28	1·13	10·17	6·18	14·67
2	Light brown .	3·27	2·14	1·13	11·14	6·30	15·19
3	Light brown .	3·67	2·31	1·36	12·10	5·41	13·09
4	Dark brown .	3·68	2·21	1·47	13·14	5·96	12·16
5	Light brown .	4·10	2·32	1·78	11·10	5·72	13·27
6	Dark brown .	3·19	2·27	0·92	12·12	6·61	14·19

AFRICAN GROUND.

No.	Colour.	Ash.	Sol,	Insol.	Cold Water Extract.	Resin Extract.	Moisture.
1	Dark brown .	2·21	1·56	0·65	7·16	4·57	15·17
2	Dark brown .	2·17	1·69	0·48	7·47	4·76	13·09
3	Pale brown .	3·47	2·16	1·31	10·74	6·47	14·17
4	Pale brown .	2·91	1·64	0·27	8·61	4·59	13·02
5	Pale brown .	2·19	1·79	0·40	7·46	5·14	12·17
6	Pale brown .	4·19	2·51	1·68	11·76	5·50	15·16

These results agree in the main with former observers, showing that the African and Cochin gingers yield more resin than the Jamaica kind, and would almost seem to be preferable to the latter for many uses.

From the foregoing results it would seem that neither the soluble ash, nor the cold water extract can alone afford a perfectly certain way of deciding as to the presence of exhausted ginger, but by a combination of the two data it is possible to arrive at more satisfactory results.

It is suggested that the following limits should be added to the official description of the characters of ginger in the Pharmacopœia: "Should yield not less than 5 per cent. resin extract to 90 per cent. alcohol. Should yield not less than 1·5 per cent. of soluble ash when incinerated with free access of air, and not less than 8·5 per cent. of a cold water extract indicating absence of 'spent' or exhausted ginger."

Gomenol. (*Merck's Report*, viii. 1900, 110.) Under this name the essential oil of *Eucalyptus viridiflora* has been introduced into medicine It is stated by Leroux and Pasteau to have a beneficial effect in chronic bronchitis and also in tuberculosis of the

lungs in children, and in whooping cough. It is given in an oily solution by means of intramuscular injections into the gluteal region, or as enemata. For injection the following solution is recommended: Gomenol 1 fl. dr., sterilized olive oil 4 fl. drs. For children 1 to 2 years old, from 3 to 5 c.c. (48 to 80 ♏) of this are to be injected; from 2 to 3 years, 7 to 8 c.c. (110 to 128 ♏); from 3 to 8 years, from 10 to 15 c.c. (160 to 240 ♏). In the form of an enema the same solution may be given in doses of 5 c.c. (80 ♏) for a child 1 year old, 10 c.c. (160 ♏) for 2 years, and 10 c.c. (160 ♏) of a 50 per cent. solution for a child aged 8 to 10 years.

Guaiacamphol. Lasker. (*Merck's Report*, viii. 1900, 111.) The anhydrotic properties of camphoric acid are emphasized in guaiacamphol, which is the camphoric acid ester of guaiacol. In doses of 3 grains it is found to be efficient in counteracting the nocturnal sweating of phthisis, although a larger dose, up to 10 or 15 grains, may be employed without ill effects. It should be given for 8 or 10 nights in succession.

Guaiacol Cacodylate. A. Astruc and H. Murco. (*Journ. Pharm. Chim.* [6], xii. 553) point out that this body, which in the form of a white crystalline salt has been introduced as a remedy for tuberculosis, and to which the formula $As(CH_3)_2O_2.C_6H_4.OCH_3$ has been attributed, is very unstable. It is very hygroscopic and is completely dissociated by a trace of water, the whole of the cacodylic acid passing into solution. By ether all the guaiacol may be removed. It is, therefore, doubtful if the body can be considered a true chemical compound. When heated, drops of liquid which have all the characters of cacodylic acid separate at about 70° C., consequently the body has no definite melting point.

Guaiakinol. J. Castel (*L'Union Pharm.*, xlii. 12) describes under this name quinine-dihybromo-guaiacolate, $C_{20}H_{24}N_2O_2 2HBr. C_6H_4OH.OCH_3$, which is a very soluble and hygroscopic salt, suitable for administration, both externally and internally, wherever its constituents are indicated. Given in the former manner it is useful in the treatment of phthisis and of fevers; externally it gives good results as an application in erysipelas.

Hermophenyl, Sodium Mercury Phenol-Disulphonate. (*Bull. Comm.*, xxix. 225.) A. and L. Lumière, with Cherrotier, have found that when alkaline phenol-disulphonates are treated with equal molecular weights of mercuric oxide, double salts are formed which are very soluble, and in which the ordinary reactions of mercury are modified. One of these, sodium phenol-disulphonate, has been introduced, under the name of hermophenyl, as a surgical

antiseptic and germicide. It is a white, amorphous, soluble powder, which, although it contains 40 per cent. of mercury, is free from the metallic taste and caustic action which characterises salts of that metal. The solution is not precipitated by albumin, by caustic soda, by hydrochloric acid, nor by ammonium sulphydrate. It may be heated under pressure to 120° C. without decomposition. It is so far free from irritant action that a 4 per cent. solution may be left in contact with the skin for hours without giving rise to any discomfort, and a few drops applied to the eye causes no reddening of the conjunctiva. A 1:500 solution injected hypodermically gives rise to no induration, and is followed by no inflammation. Although free from irritant action, it appears to retain the germicidal activity of the mercury unimpaired. Contact for five minutes with a 0·2 to 0·5 per cent. solution of the salt is sufficient to kill cultures of *Erbeth's bacillus*, *B. pyocyaneus*, *staphylococcus*, *B. subtilis*, and *B. lactis*. It may be mixed with soap without undergoing decomposition. Dressings impregnated with it may be afterwards sterilized at 120° C without affecting the active ingredient. Solutions of 1:100 to 2:100 may be used as wet dressings without harm, and a from 1 to 3 per cent. solutions may be applied directly to the mucous membrane. The compound appears to possess all the advantages of corrosive sublimate without its intense toxicity, and to be devoid of irritant and necrotic action on animal tissues.

Hæmogallol. A. Borelli. (*Merck's Report*, viii. 1900.) The good effects claimed for this pyrogallol-blood compound in anæmia and rachitis of children are confirmed. The dose should vary according to the age of the patient from $\frac{3}{4}$ to 3 grains per diem, given in the form of a powder suspended in water. No ill effects, such as derangement of the digestion, are observed, and, as it has a pleasant taste, it is readily taken.

Hetocresol. Landerer. (*Merck's Report*, viii. 1900, 117.) Hetocresol has been employed, in conjunction with betol, as a urethral injection in the form of a 1·5 solution with physiological salt solution, in washing out the bladder in urino-genital and vesicular tuberculosis; also as an application to tubercular abcesses, which are dressed with hetocresol gauze or sprayed with the solution.

Hetol (Sodium Cinnamate). (*Merck's Report*, viii. 1900, 116.) Medical opinion differs as to the value of injections of hetol in the treatment of tuberculosis. Ewald does not consider it so efficacious as Landerer and others have reported, although he obtained suffi-

ciently good results to encourage further investigation. Krokiewicz advocates the injection of minute doses of $\frac{1}{120}$ to $\frac{1}{12}$ grain.

Hyrgol (Colloidal Mercury). (*Merck's Report*, viii. 1900, 121.) After being somewhat neglected, hyrgol has been favourably reported on as a remedy in certain syphilitic affections. It is given internally in pills of $\frac{3}{4}$ grain each, 2 to 4 being taken in 24 hours. It is also used in inunctions, in the form of 10 to 33 per cent. ointments, which are employed in quantities of 45 to 75 grains per diem.

Ichthalbin. Rolly (*Merck's Digest* through *B. M. J. Epit.*, ii. 1900, 79) confirms the value of the ichthyol albumin compound, icthalbin, in a large number of intestinal disorders, such as chronic enteritis in children, subacute and intestinal catarrh, and other diseases accompanied by fermentative charges. The doses given were in most cases 8 to 15 grains three times daily.

Other investigators (*Merck's Report*, viii. 1900, 124) state that it is one of the best of the recently introduced intestinal antiseptics, and is applicable to many affections of the mucous membrane. As a tonic it is given in doses of 5 to $7\frac{1}{2}$ grains. In the chronic intestinal catarrh of children under 1 year old, 3 to $7\frac{1}{2}$ grains may be given three times daily. It may be given in cacao powder in the proportion of 1 : 2.

Iodipin. (*Merck's Report*, viii. 1900, 127.) This compound of iodine with the fatty acids of sesame oil continues to attract a great attention in Continental clinics. From numerous reports it would appear to be a valuable addition to the materia medica. It is capable of replacing the alkaline iodides wherever these are indicated, and its administration in large doses is free from any sign of iodism, while its effect is more lasting.

Iodolene. (*Merck's Report*, viii. 1900, 129.) This is a new albumin-iodol compound which is prepared for use, as a substitute for iodoform, in the form of a very fine odourless and tasteless powder. It contains 36 per cent. of iodol. It is used as a general external antiseptic as a dusting powder. It is stated not to give rise to any toxic symptoms, even when employed in large quantity.

Iron Cacodylate. Gilbert and Lereboullet (*Rev. de Thérap.*, through *Merck's Report*, viii. 1900, 54) suggest the use of iron cacodylate for hypodermic injections, since it does not give rise to the unpleasant general symptoms or the renal complications which are prone to follow the administration of iron salts in this manner. It is stated to be specially valuable in the treatment of anæmia

either when given thus, or internally by the mouth. For hypodermic use, an injection composed of iron cacodylate, 5 grains; sterilised distilled water, 160 ♏, is prescribed, of which 1 to 3 c.c., or 16 to 48 ♏, is to be injected daily. For internal use, it is ordered in the form of drops, thus: iron cacodylate, 16 grains; cinnamon water, 7 fluid drachms. 20 to 40 drops to be taken 3 times daily.

Jaborandi Leaves. E. M. Holmes (*Pharm. Journ.* [4], xii. 199.) The sources of true and false jaborandi, as represented by specimens in the museum of the Pharmaceutical Society, are thus enumerated and described: Pernambuco or Genuine Jaborandi, *Pilocarpus jaborandi.*—Leaflets elliptical oblong, slightly unequal at base, coriaceous, brownish green, with distinctly prominent veinlets on upper surface, more or less rounded at both ends, and only slightly hairy along the principal veins below. Rio or Paraguay Jaborandi, *Pilocarpus pennatifolius.*—Leaflets thinner, subcoriaceous, greyish green; veinlets on upper surface not prominent; almost glabrous, usually tapering and nearly equal below. These leaves only contain half as much alkaloid as those of *Pilocarpus jaborandi.* Ceará jaborandi, *Pilocarpus trachylophus.*—Leaflets brownish green with abundant curved 3-celled hairs on under surface. Margin recurved, nearly equal at the base. It contains no alkaloid. Aracati jaborandi, *Pilocarpus spicatus.*—Leaves simple, lanceolate, with a short petiole, which is twisted to one side, subcoriaceous, hairy. Maranham or small jaborandi, *Pilocarpus microphyllus.*—Leaves small, rarely exceeding an inch in length, rounded above, tapering below; round oil glands easily visible under a lens. False jaborandis include *Swartzia decipiens*, a leguminous plant, the leaflets of which closely resemble those of *Pilocarpus microphyllus.* It is distinguished by absence of oil glands and presence of minute reticulations on the under surface. In some leaflets, the veinlets are translucent, in others not so, so that possibly two species may be mixed in the commercial article. False Rio Jaborandi, *Piper species.*—The leaves are broadly lanceolate, thin, greyish green, with extremely minute oil glands, visible only under high magnifying power. The leaves are generally mixed with pieces of stem having the swollen joints characteristic of the genus *Piper*; they bear no resemblance to true Jaborandi leaves.

Lactic Acid as a Hair Stimulant. (*Merck's Report*, viii. 1900, 50.) Balzer states that lactic acid is a useful stimulant for promoting the growth of the hair. After cutting the growth as short

as possible it is first washed in the following antiseptic solution: mercuric chloride, 3 grains; acetic acid, 16 ♏; alcohol, 90 per cent., 3 fl. oz. 2½ drs.; ether and spirit of lavender, of each 1 oz. 5½ drs. When the hair is dry after this application, the roots are well rubbed with a 1 : 2 solution of lactic acid in water, or a 1 : 3 alcoholic solution applied by means of a pad of cotton wool. If the acid causes much irritation the treatment should be temporarily interrupted.

Lecithine. (*Nouv. Rem.*, xvii. 169.) Gilbert and Fournier have employed lecithine, derived from the yolk of egg, as a stimulant of the assimilative functions, in the treatment of wasting diseases and neurasthenia. They state that generally good results have followed its administration, and that prolonged use is unattended by any ill effects. In tuberculous patients, the treatment is followed by improvement of appetite and strength, and increase in weight; in neurasthenia, general improvement in condition are observed. The dose employed is 1½ to 7½ grains, in the form of pills, or ¾ to 2½ grains as a hypodermic injection in solution in olive oil.

Lysoform. Stephan (*Pharm. Zeit.*, xlvi. 28, after *Deutsch. Aerzt. Zeit.*) has introduced a disinfectant under this name. It is chiefly recommended for sterilising the hands. Strassman has found it to be most useful in gynecological practice. It consists of a combination of formaldehyde with a neutral soap, which is perfectly soluble in water and in alcohol.

Macaranga Kino. D. Hooper. (*Agricultural Ledger*, 1900, vii. 70.) *Macaranga roxburghii*, a small tree indigenous to the Deccan peninsula, has long been known to yield an exudation which has been described as a "resin" or a "gum." The specimen examined by the author was in the form of odourless tough tears, and masses with a fibrous fracture. When treated with water or with spirit, the behaviour of the product is peculiar and distinctive. The outer portion dissolves, leaving string-like fibres which ultimately swell and turn back, giving the tear the appearance of a sea anemone. The soluble portion is of a deep claret colour, and very astringent. The gum, which is thus identified as a kino, was found to contain from 6 to 15·2 per cent. of a tannin, and from 50 to 71 per cent. of an insoluble gum. The tannin differs from that of true kino in its reaction with ferric salts giving a purplish colour and a precipitate instead of a greenish tint. The insoluble gum which is of a distinctive character of *Macaranga* kino is pararabin, since it becomes soluble on heating

for several hours with hydrochloric acid. This kino appears, therefore, to form a class by itself, distinct from true kinos, from *Butea* kino, and from the products of the genus *Eucalyptus*. Other species of *Macaranga* stated to give a red juice are *M. denticulata*, *M. indica*, and *M. tanarius*.

Monomethyl Xanthine. Albanese (*Archiv. Ital. de Biolog.*, through *B. M. J. Epit.*, ii. 1900, 3) has investigated the therapeutic value of mono-methyl-xanthine, $C_5H_3(CH_3)N_4O_2$, comparing it with theobromine (di-methyl-xanthine), $C_5H_2(CH_3)_2N_2O_4$, and caffeine (tri-methyl-xanthine), $C_5H(CH_3)_3N_2O_4$. Mono-methyl-xanthine is normally present in traces in the urine of man and dogs, but is obtained in larger quantities from the urine of caffeinized dogs in the form of brilliant crystalline needles. It is less toxic on the heart muscle than caffeine and is much more active as a diuretic. Probably, when combined with sodium salicylate in a similar form to the theobromine compound "diuretine," mono-methyl-xanthine would be more active, and relatively less toxic. The only disadvantages are its less solubility and its source.

Malarine. (*L'Union Pharm.*, xlii. 5.) This is a new antipyretic, a condensation product of acetophenone and paraphenetidine corresponding to the formula

$$C_6H_4 \begin{cases} N \begin{cases} CH_3 \\ C_6H_5 \end{cases} \\ O.C_2H_5 \end{cases}$$

It crystallises in fine yellow needles melting at 88° C. It is only sparingly soluble in water. It is stated to be active as an antipyretic without giving rise to bad secondary effects. The dose is seven and half grains twice or three times daily.

Myristica Kino. D. Hooper. (*Agricultur. Ledger*, 1900, v. 41.) The author confirms the statements of Schaer that the inspissated juice of certain species of *Myristica* closely resembles Malabar kino in properties, but differs from it and from *Butea* kino in containing calcium acid tartrate. Authentic samples of the juice of *Myristica gibbosa*, evaporated to a dry extract, gave a kino-like product which contained tannin 33·6 per cent., non-tanning extractive 25·1 per cent., insoluble matter 26·0 per cent., ash 4·2 per cent., and water 11·1 per cent. The lime salt left insoluble on treating the kino with spirit, was identified as calcium acid tartrate. The juice of another species, *M. kingii*, similarly treated, gave a kino having the following percentage composition: tannin 30·2; non-

tanning extractive 12·5; insoluble matter 38·1; ash 6·6; water 12·6. This product also contained calcium acid tartrate. If there were a greater demand for kino than could be met by the available supply of the product of *Pterocarpus marsupium*, doubtless the juice of various species of *Myristica* might be used for the purpose At present, however, the supply of the official variety is ample for all commercial requirements.

Organo-therapeutic Preparations. (*Merck's Report*, viii. 1900, 147.) *Brain substance* has been successfully administered in certain grave nervous organic lesions and to counteract certain toxins. It is prepared in the form of an emulsion of fresh rabbit brain-matter rubbed down to an emulsion with physiological salt solution. One rabbit's brain is thus treated with 15 c.c. of the solution. The dose is 10 to 15 c.c. of the resulting emulsion. *Suprarenal capsules* and the extract therefrom are being widely used as a hæmostatic and local anæsthetic. They have given good results in coryza, epistaxis, gastric and internal hæmorrhages. The glycerin extract is said to have been efficacious in the treatment of epilepsy. Under the name of Rachitol the extract has had some success in the treatment of rickets. *Thyroid gland* and its preparations continue to give satisfactory results in the treatment of the specific affections for which it was first applied. *Spleen* and its extract have been administered to promote leucocytosis. It has been employed in typhoid and other febrile diseases. A preparation named Spleniferrin, a combination of dried spleen with an iron-albumin compound, has been introduced by B. Rhoden for the treatment of anæmia. *Mammary glands*, both dried and in the form of extract, have been used in the treatment of diseases of the female generative organs. *Red bone marrow* is found by L. R. von Korczynski to increase both the number of leucocytes and erythrocytes in the blood; injections of the substance being followed by an increased amount of hæmoglobin and an improvement in the general nutrition. *Ovary tissue* is stated to exert an influence on the determination of sex. Friedmann claims to have increased the number of male animals in a litter by administering ovarian substance to the pregnant female. In human therapeutics, E. Vidal and T. Geissler state that angina pectoris and neurasthenia are both alleviated in female patients by doses 45 to 75 ♏ of ovarian extract. *Kidney tissue* has been administered with doubtful results in certain morbid conditions of those organs. A distinct stimulation of the excretory power of the kidneys was observed to follow, with an increased elimination of urea and uric

acid. *Gastric juice* from dogs has been employed with success in gastric fistula and other derangements of the stomach, but the source of the remedy is not such as is likely to render it popular in the profession.

Palladium Chloride. S. Solis Cohen. (*Merck's Report*, viii. 1900, 159.) The salt has been employed in the treatment of phthisis; it is said to improve the condition, lessen the fever, and destroy the tubercle bacillus. It should not be given to nervous or neurasthenic patients, since it is apt to give rise to acceleration of the heart action. It is prescribed as drops thus: Palladium chloride 12 grains, distilled water 6½ fluid drachms. From 5 to 10 drops to be taken in water before meals.

Peruvian Balsam and its Synthetic Substitutes. E. Erdmann Halle (*Schweiz. Woch. für Chem. and Pharm.*, xxxviii. 593) in the examination of Peru balsam, finds that the chief constituents are two esters of benzylalcohol, the rest being resene and free acids (chiefly cinnamic and benzoic). A specimen from San Salvador gave Peru balsam oil (cinnamein) 60·8 per cent., resin 5·3 per cent., and free acids 23·1 per cent. The chief constituent of cinnamein is not cinnamic acid benzyl-ester as hitherto considered, but benzoic acid benzyl-zester. These esters are easily separated by fractional distillation *in vacuo*. The benzyl benzoate is a colourless oil which congeals at 0° C. and boils at 173° C. at 8 mm. pressure, while the benzyl cinnamate boils, under the same pressure, at 213–214° C. and is a white crystalline body melting at 37° C. The cinnamein examined contained 60 parts of benzyl benzoate and 38 parts of benzyl cinnamate. The former is not only the chief constituent, but also the therapeutic active principle. Clinical results show that the synthetic benzyl benzoate is not only a complete substitute for Peru balsam, but being colourless and of constant composition, neutral, and free from irritant action, it is preferable to the natural product. It is brought into commerce in the form of a 25 per cent. solution in castor oil under the name of "Peruol." Pure benzoic acid benzyl ester is known as "Peruscabin."

Peruvian Balsam, Production and Collection of. (*Berichte Pharm.*, xxxiii. 306.) P. Preuss, who has visited Central America to investigate the cultural conditions and methods of production of important crops and drugs, has communicated the following details with regard to Peruvian balsam. The trees are found between the latitudes 13° 35′ and 14° 10′ North, and longitude 89° and 89° 4′ West; they occur either alone or in small clusters. The tree is worked for balsam when it attains a girth of 0·6 to 1 metre, which

is when it is about ten years old. A portion of the bark is first bruised, then the outer layer is carefully peeled off, so as to leave the yellow inner bark exposed. The balsam begins to exude from this wound in about five days and is collected on a rag attached to the wounded surface. When this flow stops, the wound is burnt for a few minutes with a torch, when the flow of balsam recommences. In a few days, when this ceases, the wound is deeply cut and all the burnt portions scraped off; this operation causes a fresh flow of balsam. This third exudation thus collected is known as "Balsamo de contrastique" or "contrapique," while the first and second flow, collected on rags, is called "Balsamo de panal" or "Balsamo de trapo." Finally when the "Balsamo de contrastique" ceases to flow, the whole of the wounded bark is removed, bruised and boiled with water, yielding a third kind of balsam of stronger odour and less value, known as "Balsamo de cascaro." Commercial balsam of Peru is a mixture of these products in definite proportions. The same operation is then repeated on a higher portion of the trunk, and in several places. The yield of balsam is very variable, an average product being 300 pounds from 100 trees. A portion of the balsam is extracted from the rags by boiling with water, in which it sinks when cold; the rest is extracted by a press which at the same time filters the expressed liquid. Peruvian balsam is not adulterated locally by the producers. When sophisticated, this is done by the middleman.

Peruol. (*Pharm. Post.*, xxiii. 564.) This is a 25 per cent. solution of synthetic benzoic-benzyl ester, the peruscabine of Erdmann in castor oil. Juliusberg and Sachs (*Merck's Report*, viii. 1900, 162) find that it is efficacious and free from detrimental action when freely applied in the treatment of scabies. It has the advantage over Peru balsam that it is practically odourless and does not stain the skin or linen. It is applied by inunction over the whole body, three or four such applications being made in 36 hours. After three or four days the patient is given a hot soap bath, when a cure will be found to be effected.

Quinic Acid. H. Sternfeld (*Münch. med. Woch.*, through *B. M. J. Epit.*, i. 1901, 56) points out that in the treatment of gout and the conditions due to a gouty diathesis the first consideration should be to lessen the quantity of uric acid. Experiment shows that cherries, strawberries, and other fruits do this to a certain extent, and he has satisfied himself that this is not due to any contained alkalies, but to the action of quinic acid. He has used quinate of lithium in tablet form of a dose of 7¾ grains. He pre-

scribes up to six tablets daily, and claims to have had such good results with this, that he calls it a specific of no less value than salicylic acid is in rheumatism or quinine in malaria.

Quinine Eosolate. Cipriani finds (*Merck's Report*, 1900, viii. 78) that this salt of trisulpho-aceto-guaiacol is of value in the treatment of malaria. Combined as follows, in a pilular form it has given good results in chronic and recent malaria, and in malarial cachexia and anæmia. Quinine eosolate, 75 grains; reduced iron, 75 grains; strychnine sulphate, 1½ grains; arsenious acid, 1½ grains; extract of gentian sufficient to mass. Divide into 50 pills. Dose, for adults, 2 pills 3 times daily; for children, 1 or 2 pills daily, according to age and special circumstances.

Quinine Bark; Spurious. E. W. Pollard (*Pharm. Journ.* [4], xii. 492) has examined a specimen of so called quinine bark from Columbia, which was offered as containing 5 per cent. of quinine sulphate. This was found to contain no alkaloid (another worker found 0·06 per cent. of an extremely bitter alkaloid which gave no crystalline sulphate), a glucoside, or bitter principle, a trace of tannin and starch. Drawings of the bark and its microscopical structure are given.

Rhamnus Frangula, Rhamnus Purshianus, and Rheum; the Active Principles of. E. Aweng. (*Apoth. Zeit.*, xv. 537.) Th author has previously stated that the chief active constituent of these drugs are primary glucosides, readily soluble in water, and secondary glucosides, but slightly soluble in an aqueous menstruum. Both are extracted by alcohol 70 per cent. The bark of *Rhamnus frangula*, when treated with alcohol of this strength, gives, after distilling off the spirit and treating with dilute ammonia, a solution from which the secondary glucosides are precipitated on acidulating with acetic acid. The filtrate from this then contains only the primary glucosides, among which is the frangulic acid of Kuebly, which may be crystallised out from a mixture of equal volumes of benzene and absolute alcohol. It becomes insoluble on prolonged heating with water, but is again rendered soluble by re-treatment with ammonia, and re-liberation with acetic acid. On hydrolysis it yields frangula-rhamnetin, which gives yellowish red solutions with alkalies. The secondary glucosides yield emodin on hydrolysis as well as another glucoside, insoluble in a mixture of benzene and alcohol. Cascara sagrada also contains primary and secondary glucosides; the latter have not yet been examined. The former contain frangulic acid and a glucoside yielding emodin on hydrolysis. Rhubarb contains the same acid among its primary

glucosides. The emodin glucoside appears to be more active as a purgative than frangulic acid.

Rhamnus Frangula and Rhamnus Purshianus; Relative Therapeutic value of. E. B. Squibb. (*Amer. Journ. Pharm.*, lxxii. 311.) Experimenting with the fluid extracts of cascara and buckthorn barks, prepared with a 10 per cent. acetic acid menstruum, the purgative value of cascara is found to be about twice that of buckthorn, 0·3 c.c. of the former being equivalent to 0·5 c.c. of the latter. But buckthorn has the advantage of not occasioning griping, and of being less nauseous, whereas pain invariably accompanies the action of cascara. Half a c.c. of buckthorn extract should be given, freely diluted with water, after each meal, for the first day, after two meals for the second day, or until a mild laxative effect is produced, reducing the dose until the bowels act naturally when the aperient should be discontinued.

Rhatany Root; Spurious. P. H. Marsden (*Pharm. Journ.* [4], xii. 618) describes and illustrates by photographs the macro- and microscopic appearance of a false rhatany root, imported into Liverpool.

The root is in pieces of varying shape, usually tapering, some pieces being contorted. There are remains of stem and radical leaves on the upper part. The roots vary in size from five to nine centimetres (about two to three and a half inches) in length, by half to one and a half centimetres (say, a quarter to five-eighths of an inch) in diameter. The bark is reddish-brown in colour, rough, scaly, and longitudinally grooved, and has transverse ridges. The fracture is short and exhibits a meditullium of some 24 wedge-shaped bundles with a well-marked pericambium. The root has no definite odour, and an astringent taste.

Examined microscopically, a transverse section exhibits an outer suberous layer of flattened cells, below which are cells, similar in shape, containing red colouring matter; below these again occurs loose parenchymatous tissue of thin-walled polygonal cells, rather wider than deep. The medullary rays are strongly marked, and are from one to four or five cells in width, separating at the fibro-vascular bundles. The latter are cuneiform in shape and possess large wood vessels which on longitudinal section are seen to be thickened in a scalariform manner. There are crystals in the root, which occur more particularly in the cells forming the medullary rays.

Neither the macroscopic nor microscopic characters of this root correspond in any way with those of official rhatany.

Saffron Adulterated with Potassium Borotartrate. F. Daels. (*Journ. Pharm. d'Anvers*, lvi. 417.) A specimen of saffron was recently met with, which although of good appearance and free from insoluble dressing, gave on incineration 26 per cent. of ash, examination of which showed that the weighting substance added was potassium borotartrate. It was found by experiment that no less than 14 per cent. of that compound might be added to saffron, without materially altering its appearance. This was done by adding a solution, drop by drop, to pure saffron heated on the water bath.

Saffron, Adulteration of. Two samples of saffron of Spanish origin have been examined by Fresenius and Gruenhut (*Pharm. Zeit.*, xlvi. 99). The first contained saffron 46·73 per cent., and adulterant 51·22 per cent. This latter consisted of magnesium sulphate 25·5, borax 8·24, and neutral sodium borate 17·5. The second specimen contained saffron 56·4 per cent., and adulterants 43·6 per cent., consisting of potassium nitrate 13, neutral potassium borate 21, neutral sodium borate 6·4, and sodium hydrate 3·2. A saffron essence, also of Spanish origin, had the following percentage composition: water of solution 46·57, borax 16·87, potassium hydrate 8·94, potassium nitrate 10·03, saffron 0·41, cane sugar 9·91, dextrose 1·65, and dextrin by difference 5·63. Wauters reports on a sample of saffron adulterated by soaking in a solution of potassium nitrate, potassium tartrate, and borax, and then drying, which had the appearance of the pure article. This sample deflagrated on burning, and gave 20 to 22 per cent. of fusible ash, which readily gave the reactions for boric acid and potassium. Sodium nitrate and tartaric acid may be detected in the aqueous solution of such samples, after rendering them colourless with animal charcoal.

Saffron, Red Sandal Wood in. A. Beythien (*Chem. Centr.*, lxxii. 1174), experimenting with a number of samples of saffron powder, adulterated with ground red sandal wood, found that a good indication of the degree adulteration might be obtained by determining the amount of raw fibre present. Two specimens of safflower contained 12·53 and 11·87 per cent. Three samples of saffron, 5·47, 5·10, and 4·54 per cent. The adulterated saffron under consideration contained 20·33 per cent., so that taking the average fibre content in genuine saffron at 5 per cent., and in sandal wood 52·5 per cent., the quantity of added sandal wood would be 26·66 per cent.

Sapolan. (*Merck's Report*, viii. 1900, 167.) This is a mixture of 5 parts of fractionated raw naphtha, 3 parts of lanoline with 3 to 4 per cent. of anhydrous soap. It is said to be equal to the various tar preparations, but without their irritant action. It has been used in the treatment of a number of cutaneous diseases.

Scammony Root, Spurious. E. M. Holmes. (*Pharm. Journ.* [4], xii. 595.) A large root was recently offered to a wholesale firm in this country as scammony root, as much as five tons being on sale. In the upper portion, the root is two to three inches in diameter, and at the crown presents the scars of numerous slender stems, which seem to indicate either that it is a perennial climber, like some of the *Menispermaceæ* or that it has weak, slender, flowering stems, arising from a large perennial root, as is the case in many of the genus *Gypsophila* in the *Caryophyllaceæ*. The outer portion of the root consists of a thin, brittle bark of a blackish-brown colour, cracked and warty below the crown. A transverse section exhibits six or seven rings of wood, which readily break up into coarse, somewhat flattened fibres, so much so that three expert section cutters have stated their inability to cut a good section of it. It has no odour and no special taste, but leaves a slight acridity in the throat when chewed, probably due to some variety of saponin, since a fragment of root shaken up in a test tube with water gives a very frothy solution. Under the microscope, the most characteristic feature is the enormous quantity of minute, simple, rhomboidal, prismatic crystals present, and the absence of starch. The botanical source of this root has not yet been determined. Drawings of the root section accompany the note.

Senecio Jacobœa, Physiological Action of. J. L. Bunch (*Brit. Med. Journ.*, 2065, 212) finds that injection of an alcoholic extract of the entire plant of *Senecio jacobœa* into the circulation of a dog, in small doses, causes a rise of general blood pressure, with constriction of peripheral vessels, and of the vessels of the intestinal area. This effect is accompanied by a diminution in the magnitude of the contractions both of the auricle and of the ventricle. Large doses (0·8 to 1·0 Gm. for a dog of 7 kilos.) of the drug cause a fall of general blood pressure, with dilatation of the intestinal vessels, and inhibition of the contractions of the intestinal coat. After several injections of small doses, or after one large dose, of the alcoholic extract, further injections produce a fall of blood pressure, with slowing of the heart, and this effect is repeated unless a considerable interval is allowed to elapse before any

further injection of the drug be made, which then again causes some rise of general blood pressure. The entire plant, therefore, contains two substances with distinct physiological actions, which have not, up to the present, been separately isolated. Watery extracts of the residue, obtained by evaporating the alcoholic solution, produce a fall of blood pressure and cardiac inhibition, due to the action of the drug on the nerve terminations in the heart, and not to direct action on the muscular fibres of that organ. The substance which causes a rise of blood pressure is not contained in such watery extracts, or, if present, is only so in small quantities.

Senna: the Ash and Histological Characters of the Powdered Drug. H. G. Greenish has determined (*Pharm. Journ.* [4], xii. 397) the percentage amount of ash in the different commercial varieties of senna, which he finds to be as follows: *Alexandrian Senna* (dried at 105° C.)—(1) picked, 11·53; (2) good leaf, 12·95; (3) good leaf, 11·39; (4) good leaf, 11·67; (5) small leaf, 11·54; (6) "small out," 11·44; (7) "parv," 14·33; (8) siftings, 17·56, (9) second quality, broken leaf, 13·45; (10) poor and dusty, 19·63; (11) pods, 5·56; (12) stalks, 8·21. *Tinnevelly Senna* (dried at 105° C.)—(13) very fine picked, 13·00; (14) Opt., 9·91; (15) good leaf, 11·15; (16) good leaf, 9·78; (17) medium quality, 9·73; (18) inferior discoloured, 11·05; (19) inferior discoloured, 10·20; (20) inferior, few stalks, dusty, 20·53; (21) inferior, much stalk, 9·54; (22) very inferior and stalky, 16·77; (23) stalks, 7·32. *Other Varieties* (dried at 105° C.)—(24) Bombay senna, 11·94; (25) Mecca senna (offered as Alexandrian), 11·72; (26) *Cassia holosericea*, 13·55; (27) *Cassia obovata*, 14·90. Nos. 1, 2, 3 and 4 (Alexandrian), and 13, 14, 15 and 16 (Tinnevelly) were all in every respect suited for medicinal use.

The ash in nearly all cases was almost entirely dissolved by hydrochloric acid. It is found that when senna is powered and sifted, the gruffs yield a lower percentage of ash than the powder; with Tinnevelly senna the following percentages of ash were obtained from the gruff and from the sifted powder (dried at 105° C.):—

Gruff	10·84 per cent.
Sifted Powder . .	13·27 „

The gruffs and powder obtained in grinding Alexandrian senna on the large scale gave

Gruff (dried at 105° C.)	9·61 per cent. of ash.
Powder „ „	11·56 „ „

When it is borne in mind that this drug, ground by powerful and efficient machinery, would give much less than 7 per cent. of gruff, it is evident that the process of grinding and sifting cannot appreciably raise this figure, and the experiment with the Tinnevelly senna confirms this conclusion.

The author suggests that the following description of the powdered drug should be included in the Pharmacopœia.

"The powder exhibits fragments of epidermal tissue consisting of polygonal cells and bearing stomata and hairs or the scars of fallen hairs. Each stoma is enclosed between or bordered by two cells, arranged parallel to it; the hairs are one-celled, thick-walled and warty. It also exhibits groups of sclerenchymatous fibres, which, however, should not be present in excessive quantity. Powdered senna should yield not more than 14 per cent. of ash, which should be almost entirely soluble in hydrochloric acid."

Sodium Sulphate in small doses as a laxative. At the International Medical Congress at Paris (*Brit. Med. Journ. Epitome*, 1900, 52) Dr. Manquat said a small dose of sodium sulphate (4 to 8 Gm.) dissolved in a large glass of water at 38° C., taken in the morning fasting, is a laxative which can be recommended for ordinary constipation, and also in patients in whom it is important to prevent any effort in emptying the bowels (piles, apoplexy, persons on whom abdominal operations have been performed, etc.) Moreover, by the regular use of the same solution it is possible to obtain a true mineral water "cure," which has given him the best results in a certain number of dyspeptics. In such cases the treatment should be suspended for ten days every month.

Sodium Persulphate has been brought forward as a remedy in tuberculosis and similar wasting diseases. A. Robin (*Nouv. Rem.*, xvii. 50) considers that all the good results obtained are due solely to the stimulating action of the salt on the appetite, leading to a greater ingestion of food. He has treated many forms of anorexia with it with success, employing a solution of 2 Gm. in 300 c.c. of water, of which a tablespoonful is given half an hour before each of the two principal meals. After the course of six days, the medicine should be left off for a short period and then resumed. If no apparent effect is produced in six days, it should be entirely discontinued. J. Nicholas (*Merck's Report*, viii. 1900, 58) finds that sodium persulphate is considerably less toxic than arsenium or vanadium salts, while it is superior to them in oxidising power. Garel and G. Milian have found the salt to possess valuable properties as a stimulant to the appetite in the

incipient stages of tuberculosis and in convalescence from acute disease. In the form of a 1·3 per cent. solution it has been employed in France under the fancy name of Persodine for this purpose. It is best prescribed in simple aqueous solution thus: sodium persulphate 32 grains, distilled water 5 fl. oz. One tablespoonful for adults, or a teaspoonful to a dessertspoonful for children, according to age, in water, an hour before dinner.

Stramonium Adulterants. J. Slinger Ward (*Pharm. Journ.* [4], xii. 326) has described two cases of sophistication of stramonium leaves. In one of these the leaves of *Carthamus helenoides* was offered as cultivated stramonium. In the other instance, the adulteration consisted of a mixture of several leaves cut or broken, and the entire leaves of *Xanthium strumarium.* The following are the chief points which distinguish the leaves of *Carthamus helenoides* from those of *Datura stramonium.* (1) The large size of the epidermal cells, their straight walls and well-marked striation. (2) The large size of the protective hairs, the number of cells of which they are composed, and the absence of warty protuberances. (3) The glandular hairs also arise from the whole surface of an epidermal cell instead of a small spot, as in stramonium. (4) The entire absence of stellate crystals and the rare occurrence of crystals of any sort. (5) The presence of well-developed secreting ducts.

Xanthium strumarium may be detected by the following characters. (1) The presence of striations on the cuticle and of small papillæ over the veins. (2) The fact that the stomata are surrounded by four or five similar cells, the small cell observed in stramonium not being present. (3) The absence of hairs. (4) The absence of crystals.

A full histological description with drawings of the structure of the two adulterants accompanies the paper.

Strophanthin and Pseudostrophanthin. F. Feist. (*Apoth. Zeit.*, xv. 469.) Attention is called to the chemical and physiological difference between the strophanthin, $C_{40}H_{66}O_{19}$, of Fraser, and the pseudostrophanthin, $C_{40}H_{60}O_{16}$, of Arnaud. Gley has found the latter to be nearly twice as toxic as the former. The two glucosides differ markedly in melting point and chemical reactions. Strophanthin was originally obtained by Fraser from the green seeds of *S. kombé*, and its presence in other varieties has not been definitely settled, whereas pseudostrophanthin would appear to be generally met with. It is suggested that the botanical source

and the determined lethal dose should be given with each specimen of commercial "strophanthin" prepared.

Strophanthus Kombé Seeds of Commerce. E. M. Holmes. (*Pharm. Journ.* [4], xii. 486.) From material received direct from Nyassa-land it is concluded that (1) the species of strophanthus known to grow in Nyassa-land and which there is every reason to suppose furnish some of the so-called kombé seeds of commerce, are (*a*) *Strophanthus kombé*, Oliv., (*b*) *Strophanthus emini*, Asch., (*c*) *Strophanthus courmontii*, Sacl., and the varieties which the author has here called var. *fallax* and var. *kirkii*. (2) That the *S. courmontii*, var. *kirkii*, has a shorter pod, with brownish seeds and a smaller flower, and leaves with more patent veins than the plant figured by Franchet in his "Etudes sur les Strophanthus," and that the seeds of this plant have recently come into commerce in London mixed with the greenish seeds of *S. Kombé*. (3) That the seeds of *S.* var. *kirkii* give a red reaction with sulphuric acid.

In a recent paper on strophanthus seed by Professor C. Hartwich, of Zurich, that authority gives an account of his examination of a parcel of scraped strophanthus pods from Nyassa-land, forwarded to him by the author, in which he distinguishes four forms as follows. (1) The principal kind had a pod 22–25·5 Cm. long, the seeds were greenish, but gave a red colour with sulphuric acid. No oxalate of calcium was found in either seed coat or embryo. (2) Pods 19·5 to 24 Cm. long, seeds clear brown, giving a blue reaction with sulphuric acid. Single crystals of calcium oxalate present in the sub-epidermal layer of the seed coat, no cluster crystals in the embryo. (3) Pod 25 Cm. long, seeds brownish green, giving a red reaction with sulphuric acid. Calicum oxalate crystals present in the seed coat, but no cluster crystals in the embryo. Taste slightly bitter. (4) As *S. courmontii*, Sacl., is characterised, according to Payrau, by the presence of crystals in the seed coats, the only seed that Dr. Hartwich could refer to this species would be No. 2, but Franchet states that the pods of that species are longer (25 to 27 Cm. long), and no mention is made by either Payrau or Franchet of the blue reaction with sulphuric acid. *S. emini*, Asch., according to Hartwich, has greyish-green seeds with cluster crystals of calcium oxalate sparingly present in the embryo, and gives a red reaction with sulphuric acid; but he states that none of the seeds in the parcel sent to him present such crystals in the embryo and, therefore, do not appear to belong to *S. emini*, so that unless it can be shown that the sparingly-present cluster crystals in the embryo

of *S. emini*, Asch., fail occasionally, or have been overlooked, there is no evidence of the seeds of *S. emini* being one of the four varieties found. It should be noted, however, that Hartwich has not used concentrated sulphuric acid, but acid diluted with 20 per cent. of water to sp. gr. 1·73 to obtain his reactions, and that to obtain the blue colour satisfactorily 10 per cent. more of water should be added, but with this strength the red and green reactions are weak. It should be further mentioned that whereas the green colour appears quickly, the red and blue tints do not appear for several minutes.

The statements concerning the presence of crystals made by various authors are, he points out, not altogether reliable, as some doubt concerning the authenticity of the seeds exists in some cases. Until therefore well-authenticated seeds have been as carefully examined as were those of *S. kombé* by Perrédès, the green colour reaction is the only test that can be considered of value for the purpose of pharmacy. Unless, therefore, it be possible to obtain in commerce a regular supply of kombé seeds giving the green reaction, it will be necessary to give due consideration to Feist's suggestion, that pure strophanthin or pseudostrophanthin should be employed instead of a tincture made of a mixed seed, which, if it gives a red reaction, may owe that reaction to pseudostrophanthin, ouabain, or even a sugar alone, and thus may vary exceedingly in strength. Indeed, it has been shown that the red reaction may occur in seeds that have little bitterness, and which are not considered by the natives in Africa to be poisonous. The only other alternative would be to import pods of *S. emini*, which alone, so far as is known, have a woolly coat. This is used as an arrow poison by the natives, and as, according to Hartwich, its seed gives a red reaction with sulphuric acid, it possibly owes its activity to pseudostrophanthin.

Strophanthus Seeds, a New Admixture. P. E. F. Perrédès (*Pharm. Journ.* [4], xii. 518.) The author has examined an admixture with official strophanthus seeds which was found in a commercial specimen of "Mandala strophanthus" which appeared in the London drug market in January, 1901. These seeds, slightly smaller than the typical specimens, were of a brownish tint, and could from their appearance be picked out by hand from the mixed parcel. A very thorough and complete description of the histological characters of these seeds, which are referred to *Strophanthus courmonti*, var. *kirkii*, is given accompanied by drawings. The chief points in which they differ from typical strophanthus are thus summarized :—

(1) The smaller average size and more lanceolate shape.

(2) The distinctly brown colour.

(3) The absence of a distinct ridge on the ventral surface.

(4) The absence of dome-shaped outer walls in the longitudinal sections of the epidermal cells, this being due to the absence of lignified ascending bands.

(5) The presence, in great abundance, of "prismatic" crystals of calcium oxalate in the sub-epidermal tissue of the seed-coats.

(6) The absence of a dark green colour in the albumin when a section is treated with concentrated sulphuric acid.

(7) The less intense bitter taste.

Sulphosote. (*Merck's Report*, viii. 1901, 177.) This is the trade name for potassium-creosote-sulphonate. It is extremely hygroscopic, and is, therefore, put on the market in the form of a syrup. It has given good results in tuberculosis. The dose of the syrup is 1 teaspoonful 3 times daily for adults, and 2 teaspoonfuls for children.

Suprarenal Medulla Extract. A. E. Schafer (*Brit. Med. Journ.*, 2104 1009) states that a solution of suprarenal medulla is a most active agent for stimulating or causing uterine contraction. Since the active principle is unaffected by the gastric secretion it may be administered by the mouth, but in *post partum* cases, it would doubtless be more advantageous to inject it directly into the uterine cavity. The solution for this purpose consists of 30 grains of the medullary matter from healthy ox or sheep suprarenal capsules, dried on glass at a temperature below 50° C. and powdered. The solution should be sterilized by boiling and injected while fairly hot. It is a powerful styptic; its value in this respect being still further increased by the addition of 60 grains of calcium chloride to the pint. The extract is also of the greatest value in cases of sudden cardiac failure from shock, hæmorrhage, or from an overdose of anæsthetic. In these cases a sterilized decoction of 5 grains of the dry medullary matter in the ounce, is slowly injected, after filtration, into a superficial vein, or even, in extreme cases, into the heart itself. A dose of 5 grains in a 0·9 per cent. warm solution of salt may be injected intravenously without any fear of deleterious results.

Tang-Kui Root as an Emmenagogue. A. Mueller (*Münch. Med. Wochenschr.*, through *Bull. Comm.*, xxix. 85) states that the root known in China as Tang-kui, where it has been held in esteem for centuries as an emmenagogue, has lately been introduced into European medicine under the name of "Eumenol." The

author has found the fluid extract of the drug to be very effectual in the treatment of menstrual disorders in doses of a teaspoonful three times daily. It is stated to be non-toxic and not to provoke abortion.

Tropacocaine Hydrochloride. (*Merck's Report*, viii. 1900, 182.) Bloch states that tropacocaine is more powerful as an anæsthetic than cocaine, and, being comparatively harmless, may be employed in larger quantity. It is specially adapted for use in Schleich's method of obtaining anæsthesia, also in dental operations.

Tyratol (*Oesterr. Zeitschr. für Pharm.*, lv. 236) is a thymol carbonate obtained by the action of phosgene gas on sodium thymolate. It occurs as a white neutral crystalline powder with a slight thymol odour. It is introduced as a remedy for tænia and ascarides, and is reputed to be very efficacious. The dose for an adult is 30 grains twice or thrice daily, for children 7 to 15 grains.

Validol Camphorate (Schwerzenzki, *Pharm. Zeit.*, xlvi. 666) is a 10 per cent. solution of camphor in validol (a menthol valerianic acid preparation), which, according to Ritter, is an excellent toothache specific. It is applied in the usual way on a cotton-wool wad.

Vanilla, Cultivation and Preparation of, in Mexico. P. Preuss. (*Berichte Pharm. Ges.*, xxxiv. 24.) Vanilla is principally cultivated in the province of Vera Cruz, the centre of the industry being Papomtla, and the port of export, Tuxpam. The product of semi-wild plantations, "vainillades," is either sold in the raw state to expert curers, "vainilleros," or else the farmers engage itinerant curers, "beneficiadores," to cure the pods. To start a "vainillal" a plot of virgin soil is chosen covered with a low growth of bush. The undergrowth is cut down, burnt, and the ground sown with maize. As the maize grows a new growth of shrubs appears. These are for the most part cut down, leaving one bush every five feet or so apart, to serve as supports for the vanilla plants. Preference for this purpose is given to *Taberna montana*, *Nectandria sanguinea*, and *Hamelia patens*. At the base of these, when they reach a height of five feet, two or three cuttings of the vanilla plant of the same length, and bearing a few leaves, are planted in trenches, and the upper part is tied to the supports. The buried portions soon root, and then the adventitious roots appear on the stem, fixing themselves to the support and descending to the ground, where they branch. It often happens that the lower part of the stem entirely dies away without affecting the vigour of the

upper growth. The supporting plant grows with the vanilla, and when the latter reaches a height of seven feet, it is trained across to other supports. The flowers appear at the third year Fertilization is brought down either naturally, by insects, or artificially; by the latter expedient a heavier crop is obtained, since more fruits set, but these are not so fine as those resulting from natural fertilization. The fruits are collected until the tenth year, when the plantation is abandoned. The pods are gathered as soon as their colour changes to a yellowish green. They are then exposed to the air for 24 hours, picked over, and graded. The curing is thus conducted: slightly sloping cement platforms are arranged beneath a whitewashed wall, exposed to full sunshine; these are covered with mats the first thing in the morning, on which dark woollen cloths are laid. About ten o'clock these are hot enough to receive the vanillas, which are then arranged in rows, perpendicularly to the wall, as close to each other as possible without touching. Towards two o'clock these have become so hot that they can scarcely be held in the hand; they then begin to sweat and to turn brown. While the pods are being heated, wooden boxes lined with black wool are also exposed to the sun rays; the warm pods are then quickly gathered up and packed regularly in the hot boxes. When full, these are covered up and transferred to a closed place. Between 9 and 10 the next morning the boxes are again opened, and it is found that the vanilla has further sweated. The process is repeated daily for 3 to 14 days, according to the temperature. The pods are then dried on sacking trays in dark chambers, being exposed for a few minutes each day to the sun. In wet or cloudy weather the vanilla is stove-cured in a hemispherical oven, called a "poscoyon," into which it is packed in bundles of 400 pods. The temperature is regulated between 112–124° C., according to the number of pods treated. After being heated for 2 hours the pods will have become a rich brown; they are then taken out, but left tied up until the next day. The process is then completed as described above by drying on shelves. When cured, the pods are packed in tins. Vanillas are oiled to prevent the growth of mould, and the appearance of small sandy crystalline particles known as "garro." The pods are finally graded; those that are defective are cut into small pieces known as "picadura." The others are classed, according to their colour and aroma, as "superior," "buena," and "mediana."

Vioform. E. Tavel and Tomarkin. (*Deutsch. Zeitschr. für Chirurg.*, through *Merck's Report*, viii. 1900, 183.) Iodo-

chloroxy-quinoline is introduced under this name as a substitute for iodoform, to which it is stated to be superior in bactericidal power, as well as having the advantage of being devoid of any toxic power.

Urea in Tuberculosis. H. Harper. (*Lancet*, clx. 694.) By the internal administration of urea in doses of 20 grains 3 times daily, as well as the hypodermic injection, into the gluteal region, of 40 grains dissolved in 4 drachms of sterilized water, the author has obtained such good results in a number of cases that he regards urea as a direct antitoxin to the tubercle bacillus. The greater number of cases were treated with the remedy *per os*; a series of remarkable results are given which, if substantiated by further similar successes, would indicate that urea is one of the most valuable remedies yet discovered for the treatment of tubercular affections.

Whitethorn Fruit as a Heart Tonic. — Jennings. (*L'Union Pharm.*, xli. 254.) A strong tincture, 1 : 3, of haws is stated to act as a marked tonic on the heart when given in a single daily dose of 10 to 12 minims.

PHARMACY.

PART III.

PHARMACY.

Acetic Acid as a Percolation Menstruum. E. B. Squibb. (*Amer. Journ. Pharm.*, lxxii. 311.) Comparing the value of 10 per cent. acetic acid as a percolation menstruum for the official (U.S.P.) rhamnus barks, the author finds that although an alcoholic menstruum appears to give a more rapid exhaustion, in point of time, the resulting fluid extracts are more satisfactory with the acid menstruum, being thinner and clearer, keeping better, with less deposit, more palatable and of greater laxative action.

Æsculus Hippocastanum for Hæmorrhoids. (*Pharm. Centr.*, xli. 805.) The fluid valoid extract, prepared from the pericarps of the fruit of the horsechestnut, is a valuable remedy for painful hæmorrhoids. It may be dispensed, when prescribed, in the following manner. (1) Fluid extract of horsechestnut 200, chloroform 35. Mix. Ten to 15 minims in water or wine morning and night. (2) Fluid extract of horsechestnut 5 drachms. Fluid extract of hamamelis, 2½ drachms; oil of peppermint, 2 drops. Dose, as above.

Alcohol Pencils. (*L'Union Pharm.*, xlii. 99.) Unna employs crayons of alcohol for local application in certain cases of skin disease. These are prepared by dissolving sodium stearate 6, in alcohol 100, and glycerin 2, with the aid of heat. The warm liquid is run into moulds and the pencils, when cold, are stored in tin tubes.

Aqua Magnesia Effervescens Mitior, and Aqua Magnesia Effervescens Fortior. (*Therap. Monats.*, xv. 5.) These two variants of the familiar fluid magnesia are recommended by Jawoiska as remedies for digestive troubles. They are composed as follows. *Aqua magnesia effervescens mitior*—Magnesium carbonate 5, magnesium salicylate 1, are dissolved in aerated water 1,000. The dose is half a tumblerful after each meal. *Aqua magnesia effervescens fortior*—Magnesium carbonate 10, sodium

chloride 5, aerated water 1,000. The dose is 1 to 2½ tumblerfuls to be taken once daily, in 15 to 30 minutes, fasting.

Basicine as a Vehicle. (*Merck's Report*, viii. 1900, 72.) In addition to the direct use of this so-called compound of caffeine and quinine (see *Year-book*, 1900, 218), it is now brought forward as a vehicle for the preparation of hypodermic injections of potent drugs. It has been used in solution in an equal weight of water for the preparation of hypodermic injections of most of the highly toxic alkaloids.

Belladonna, Official Extracts of. Edmund White (*Pharm. Journ.* [4], xii. 196) finds that certain commercial specimens of the official extracts of belladonna do not, in any way, correspond to the characters of those obtained by rigid adherence to the official processes, which are based on the results of R. A. Cripps (*Pharm. Journ.* [3], xxv. 793). In the case of the fluid extract, the difference in appearance, in alcoholic strength, and in the proportion of inert extractive matter to alkaloids, is due, in the author's opinion, to departure from the official prescription, with the object of effecting a more thorough exhaustion of the root, and of recovering a portion of the alcohol by distillation. The importance is emphasised of maintaining uniformity in appearance and in general characters in potent preparations which are much used.

Liquid Extract of Belladonna. When the official process is strictly followed, the resulting fluid extract has a deep sherry colour, a sp. gr. varying from 0·917 to 0·925, and contains from 12 to 13 per cent. of total solids, or a ratio of solids to alkaloids from 16 : 1 to 17 : 1. Two commercial specimens were found to have a much darker colour, the sp. gr. respectively 0·953 and 0·955, total solids 15·6 per cent. and 20·8 per cent.; ratio of solids to alkaloid 20·8 : 1, and 27·7 : 1. The percentage of alcohol in each instance was correspondingly low. Tinctures prepared from these extracts were markedly deeper in tint than those obtained by the dilution of the properly made official extract. That the official process does not entirely extract the alkaloid of the root was fully recognized by its originator; the characters of these commercial extracts indicate that probably complete exhaustion of the root has been effected by further percolation than the official process prescribes, the volume of the percolate thus obtained being reduced by evaporation. This recovery of alcohol and alkaloids is best accomplished, according to the author, by expressing the marc after the prescribed amount of percolate has been obtained, and reserving this expressed alcohol for a subsequent extraction. If

the alcohol be recovered by distillation, either before or after expression, it will be found to have a distinctive odour so that it is only fit for use in the preparation of belladonna extracts.

Alcoholic Extract of Belladonna. In the original communication of Cripps, two forms of solid extract were described: an alcoholic extract containing 3 per cent. of alkaloids, and a pulverulent extract under the name of *Pulvis Extracti Belladonnæ Compositus*, containing 1 per cent. of alkaloids. The latter preparation has been adopted almost unaltered by the authorities, under the name "alcoholic extract of belladonna." It is evident that, if the official directions be carried out, the resulting product will have a pulverulent form. There is, however, some ambiguity in the official directions as to the temperature at which the evaporated fluid extract is to afford the "moderately firm extract." If this consistence be attained at water bath temperature, the result will be, when cold, an extract so dry that when mixed with the prescribed quantity of milk sugar, a powder will result. If however the official directions be interpreted to mean a "moderately firm extract" when cold, then the milk sugar mixture will have a more or less pasty consistence. Again, if the original fluid extract has been prepared strictly in accordance with the official directions, the amount of residue will be such, that it will give a slightly coherent powder when mixed with the milk sugar. If, however, percolation has been pushed to extreme limits, until the alkaloid has been all removed, the amount of extractive obtained will not produce a dry milk sugar extract and will be unduly coherent. Moreover, the normal dry pulverulent extract is not markedly hygroscopic; in fact, when exposed to the air, it tends to lose weight slightly, whereas the soft tenacious extracts show a marked tendency to absorb moisture.

That the official prescription is not generally followed is evident from the consistence of the majority of trade samples met with, which occur invariably in the form of a more or less soft pasty extract. Both from its stability, and from its convenience for dispensing purposes, the alcoholic extract should be in the form of a dry slightly coherent powder, which should show but little alteration in weight when exposed to the air. It is further desirable that an official standard of at least 0·4 per cent. of alkaloids should be adopted for belladonna root itself, in order to insure that the extracts prepared from it may contain the necessary amount of alkaloid, in proportion to its extractive.

Benzoin, Compound Tincture of. G. F. Merson. (*Pharm. Journ.* [4], xii. 209) finds that the deficiency of solid residue

sometimes met with in commercial specimens of this tincture is due, in great part, to the use of low grade storax, and possibly also, in a less degree, to defective manipulation in the process of manufacture. When the official prepared storax is employed, even if a low grade benzoin be used, and the other ingredients be properly dissolved, the amount of solid residue on evaporation to dryness will not fall below 17 Gm. per 100 c.c., whereas a tincture made from good Siam benzoin and liquid storax will give a residue considerably below 16 Gm. per 100 c.c. The author considers the figures of Fletcher and others to be too low, and would accept nothing lower than 17 Gm. per 100 c.c. as the limit for solid residue, and a sp. gr. of the tincture of 0·8983. The official process for the preparation is thus modified. The aloes in coarse powder and the benzoin in No. 40 powder are added to about half the spirit, shaken well and occasionally in the course of 12 hours. The storax and tolu, softened by gentle heat, are then dissolved in about half the remaining spirit, aiding solution by gentle heat and rotatory agitation. When quite dissolved, the alcoholic solution is decanted into the benzoin solution, the vessel being washed out with the remaining portion of spirit. The mixture is allowed to stand for 12 hours, decanted, the sedimentary portion filtered, the portion on the filter being finally washed with sufficient spirit to adjust the total filtrate to the prescribed volume. The author employs a tall narrow cylindrical tin to dissolve the tolu and storax, employing the heat of a shallow water bath, to prevent loss of alcohol by evaporation. (This could also be done by employing the familiar upright condenser of long glass tubing, which could be fitted to a vessel of any material and of any size.)

Bromipin Emulsion. (*Merck's Report*, viii. 1900, 76.) The following is recommended as affording an elegant means of dispensing bromipin. Bromipin (10 per cent.) 3½ fl. oz., emulsify with the yolks of two eggs, then add cognac ½ fl. oz., menthol 2½ grains. Three to four tablespoonfuls to be taken daily.

Calcium Carbonate Increases the Solubility of Boric Acid, according to Crouzel (*Repertoire*, xiii. 3) in a marked degree. Scholz pointed out, in 1887, that magnesia and magnesium carbonate have similar properties. The first-named author mixes boric acid 10, with calcium carbonate 1, and water 100, heats to boiling and filters. After allowing the solution to stand in the cold for 24 hours, the precipitated calcium borate is filtered out.

Borax, and sodium bicarbonate have the same action, but in a less degree.

Carbolic Acid, Liquefied. E. W. Lucas (*Chem. and Drugg.*, lvii. 889) calls attention to the inconveniently high melting point of the official liquefied carbolic acid, and the fact that the ratio of phenol to water in the official formula is not a simple one. The author suggests the adoption of a solution containing 5 parts by weight in six fluid parts, such as may be obtained by dissolving 50 oz. of phenol and adding sufficient water to produce 60 fl. oz. This has a sp. gr. of about 1·058, and does not congeal until it reaches nearly 2° C. Since each fluid drachm contains 50 grains of phenol its convenience for dispensing is manifest.

Cascara Sagrada, Tasteless Fluid Extract of. E. Aweng. (*Oesterr. Zeits. für Pharm.*, lv. 6.) Cascara bark 1000 Gm. is infused twice in succession with sufficient hot water to cover it, each infusion lasting for six hours, and the residue being pressed after each. To the bulked liquid, solution of ammonia 200 c.c. is added, and the mixture evaporated on the water bath to 800 c.c. When cold, milk of lime is added until a distinct alkaline reaction is obtained. The mixture is allowed to stand for 4 days, then filtered; the alkaline filtrate is treated with sufficient tartaric acid to give a faintly acid reaction, allowed to stand for a week, and the precipitated calcium tartrate removed by filtration. Alcohol (90 per cent.) 200 c.c. is then added to the filtrate, and the weight of the fluid extract finally adjusted to 1000 Gm. by the addition of distilled water.

Cascara Sagrada, Liquid Extract of. G. F. Merson (*Chem. and Drugg.*, lviii. 21), as a result of experiments and from data obtained in the examination of trade specimens, concludes that liquid extract of cascara should have (*a*) the sp. gr. of approximately 1·0615 at 15·5° C. (*b*) It should yield from 23 to 25 Gm. of dry solids from 100 c.c., and (*c*) contain about 19·25 per cent. of alcohol by volume.

Cascara Sagrada, Liquid Extract of. Fraser McDiarmid. (*Pharm. Journ.* [4], xii. 55.) The sp. gr. of the fluid extract prepared from rich bark has been found to be 1·080 and 1·075. The former yielded 28 Gm. of extractive, dried at 110° C. from 100 c.c., and had the alcoholic strength of 17·81 per cent. The latter gave 27 Gm. of dry extractive from 100 c.c., and

contained 17·26 per cent. of alcohol. The author does not agree with Umney that more than the official quantity of alcohol is necessary to prevent fermentation. He, with Merson, attributes the high percentage of extractive—56·76 and 57·88, found by an Irish analyst in so-called "Liquid Extract of Cascara B.P."—to be due to the presence of glycerin.

Chaulmoogra oil, Pills of. P. C. Unna (*Monats. für prakt. Derm.*, through *Merck's Report*, viii. 1900, 145) first saponifies the chaulmoogra oil with caustic soda, and after salting out the soap this obtained, masses into pills with the following fatty excipient: beef suet 500, yellow wax 100, solution of coumarin, 10 per cent., 5. Every 3 parts of the soap are dissolved in 2 parts of distilled water on the water bath, then 2 parts of the above excipient and 1 part of kaolin are added, and the mixture formed into pills each of which should weigh 7 grains. Ten of these pills should be taken per diem.

(This pill is, rather, a bolus. For English patients two pills of half the size should be substituted.)

Chloretone, The Pharmacy of. W. Lyon (*Pharm. Journ.* [4], xii. 521) gives the following practical details with regard to this hypnotic, which has previously (*Year-book*, 1900, 219) been described. An elegant, if not particularly palatable, mixture may be made by dissolving it in a strong tincture and diluting with glycerin. Thus—Chloretone, 15 grains; tincture of orange peel, 60 minims; glycerin to make 120 minims. Or, chloretone, 15 grains; tincture of lemon peel, 60 minims; glycerin to make 120 minims. These give the normal dose of chloretone in a dessert-spoonful. When mixed with water the chloretone at once separates, but the aromatic tinctures tone down its nasty taste. Such patients as are accustomed to the use of strong alcohol may take it undiluted, but in such cases it ought to be followed by a draught of water to expedite its passage into the circulation. Compound tincture of cardamoms makes a pleasant vehicle, but a larger proportion is required than with either lemon or orange tincture. For instance, chloretone, 15 grains; compound tincture of cardamoms, 90 minims; glycerin to make 120 minims, makes a suitable dose. Such a mixture is not only pleasing to the eye, but is fairly palatable.

Instead of diluting with glycerin, the tinctorial solution may be emulsified with mucilage of acacia and diluted with an aromatic water. The following is an illustration—Chloretone, 15 grains;

tincture of orange peel, 60 minims; mucilage of acacia, 90 minims; aromatic syrup, 60 minims; orange flower water to 1 oz.

Further, advantage may be taken of the solubility of chloretone in olive oil if a spirituous solution is an objection. Such a mixture would be: Chloretone, 15 grains; olive oil, 60 minims; mucilage of acacia, 60 minims; aromatic syrup, 60 minims; cinnamon water to 1 ounce. The chloretone and oil are put in a corked or stoppered bottle, which is immersed in warm water and shaken until solution is effected. The oil is then cooled and emulsified in the usual way.

In the case of children any of the foregoing mixtures would be suitable provided they were diluted. The last two mentioned would have, without alteration, a dosage of one or two teaspoonfuls. Those with tincture and glycerin would have to be diluted to 1 oz. with glycerin in order to make the dose exactly similar. Chloretone has also been recommended as a preventive of vomiting in whooping cough. It can be combined with bromoform in a mixture as follows—Bromoform, 2 minims; chloretone, 1½ grains; tincture of orange peel, 1 minim; mucilage of acacia, 20 minims; water to 60 minims. Or, bromoform, 2 minims; chloretone, 1½ grains; tincture of orange peel, 10 minims; glycerin to 60 minims. The latter is to be preferred, being of nicer appearance. The other, on standing for twenty-four hours, shows a sediment which adheres to the bottom of the bottle, and is diffused with difficulty.

Chloretone may be given in combination with the usual whooping cough mixture. The following gives a fairly good mixture, the deposit, which takes place on standing for some time, being quite diffusible—Chloretone, 12 grains; ammonium bromide, 16 grains; ipecacuanha wine, 24 minims; tincture of belladonna, 12 minims; syrup of tolu, 80 minims; tincture of squills, 12 minims; mucilage of acacia, 1½ drachms; infusion of senega to make 1 oz. Dissolve the chloretone in the tinctures, adding a few drops of rectified spirit if necessary, and emulsify with the mucilage, add the wine and syrup, and finally the ammonium bromide dissolved in the infusion. For a single draught mucilage of tragacanth is an efficient suspender, but on keeping for some time the chloretone aggregates, and is not very evenly distributed by shaking, hence it is not to be recommended where there are several doses in one bottle. As a draught the following is satisfactory—Chloretone (finely powdered), 15 grains; mucilage of tragacanth, 2 drachms; oil of cassia or oil of wintergreen, 1 drop; water to make 1 oz.

For hypodermic injection to produce local anæsthesia prior to

minor surgical operations, olive oil may be used when the strength of the solution is not required to exceed 1 : 10; where stronger solutions than this are required ether may be employed as the solvent. Chloretone is soluble in cold glycerin to the extent of 1 : 20, so that it is available for throat application in that vehicle, or added to the official glycerins, although its solubility in glycerin of tannic acid or in glycerin of borax is somewhat diminished. It might be prescribed in a modification of carron oil, in which a 2·5 : 100 solution in olive oil is substituted for the simple oil. Chloretone is also recommended as an application for hæmorrhoids, and for such cases the following three ointments will be found suitable: (*a*) Chloretone, 48 grains; benzoated lard, 432 grains. (*b*) Chloretone, 48 grains; olive oil, 180 grains; wool fat, 252 grains. (*c*) Chloretone, 24 grains; wool fat, 216 grains; olive oil, 180 grains; liquid extract of hamamelis, 60 grains.

The only difficulty in making these is that chloretone volatilises somewhat readily, and as a consequence a little care is required to prevent loss of the active ingredient. The method to be followed in the case of (*a*) is to melt a portion of the lard and pour it into a bottle containing the chloretone, cork securely and agitate in warm water until solution is brought about. The bottle is then partially cooled and the contents transferred to a cold mortar containing the lard, and quickly mixed. The same method is applicable in the case of (*b*), the chloretone being dissolved in the oil. These two are ointments of the usual consistence. The remaining one is much softer, being intended for dispensing in a collapsible tube and applied with an ointment nozzle. In this case a bottle is used instead of a mortar. Place the chloretone and oil in a stoppered bottle, and dissolve by aid of warm water. Melt the wool fat and add it to the chloretone and oil. When properly mixed add the liquid extract and mix thoroughly by agitation. Partially cool the bottle and rapidly transfer to a collapsible tube. The only other likely combinations of chloretone are suppositories and a dusting powder. For the former the two following will be found reliable: (*a*) Chloretone, 6 grains; theobroma oil, 54 grains. (*b*) Chloretone, 6 grains; theobroma oil, 48 grains; liquid extract of hamamelis, 6 grains.

In both cases the percentage of chloretone and of liquid extract may be increased if necessary. The oil is melted on a water bath, the basin containing it is then cooled down by immersion in cold water. When the oil is nearing the congealing point the chloretone (finely powdered) is expeditiously mixed with it and then poured

into the mould. When the liquid extract is used as well, it should be mixed with the oil before the chloretone is added.

For dusting, chloretone may be used alone or in combination with the usual components of dusting powders. The following may be given as a type of this class: Chloretone, 24 grains; oxide of zinc, 120 grains; talc, 96 grains.

The chloretone must, of course, be finely powdered previous to mixing it with the talc.

In conclusion it may be mentioned that chloretonised oil has been successfully used as a substitute for carbolised oil in cases when the eye has been burned. A 10 per cent. solution may be prepared in the cold, but if urgently wanted, the oil and chloretone are put in a stoppered bottle and solution accelerated by the aid of warm water. The oil should always be freshly prepared, as it has a tendency to separate when it is kept for some time.

Coca Wine. (*Amer. Drugg.*, xxxvii. 307). Coca leaves (ground), 4 oz. troy; hot water, 16 fl. oz.; alcohol, 6 fl. oz.; sugar, 6 oz. troy; port wine (domestic), enough to make 64 fl. oz.

Moisten the drug with the hot water and allow to macerate three or four hours. If dry, moisten with wine and pack in percolator and percolate with wine until 56 fl. oz. are obtained. In this dissolve the sugar, add the alcohol and strain, adding sufficient wine to make 64 fl. ozs.

Each fluid ounce represents thirty grains coca leaves. The preliminary maceration with hot water results in the finished product containing a larger percentage of the active principles, and so more truly representing the drug.

Compound Tinctures, Official. F. H. Alcock. (*Pharm. Journ.*, [4], xi. 415.) It is suggested that the compound tinctures should be prepared by mixing equivalent volumes of simple tinctures of the ingredients, instead of directly from drugs as at present. Thus in the case of compound tincture of cinchona, it is pointed out that all the ingredients are represented by official tinctures, which might advantageously be used in their relative proportions to produce the compound.

Concentrated Liquors, Official. F. Bascombe (*Chem. and Drugg.*, lviii. 20) has observed the loss of extractive by deposition in the official concentrated liquors after standing for one week, and again after setting aside for a year, as shown in the following table:—

	Sp. gr. at 15·5° C.	Extractive at 100° C.	Extractive after standing a Year.
Liq. calumbæ conc.	1·015	5·85	3·05
Liq. chiratæ conc.	0·999	4·56	3·86
Liq. cuspariæ conc.	1·016	9·65	8·18
Liq. krameriæ conc.	1·008	7·47	5·17
Liq. quassiæ conc.	0·979	0·25	0·25
Liq. rhei conc.	1·036	13·67	12·56
Liq. sarsæ co. conc.	1·038	11·91	10·26
Liq. senegæ conc.	1·048	20·16	16·39
Liq. sennæ conc.	1·015	10·28	8·66
Liq. serpentariæ conc.	1·002	5·25	4·97

The author unfavourably criticises, in particular, the preparations of calumba, krameria, senega, and senna.

Condurango, Fluid Extract of. J. Warin (*Journ. Pharm. Chim.* [6], xiii. 506) finds that alcohol 45 per cent., used to extract condurango bark in No. 70 powder, is a more efficient menstruum than either of the glycerin, spirit, and water mixtures of the German and Swiss Pharmacopœias, or than weaker or stronger alcohol. He also finds that the qualitative test for alkaloid, with tannin, as given in the two above named Pharmacopœias is capable of quantitative application. 10 c.c. of the fluid extract is diluted with 40 c.c. of water, heated to boiling and filtered through a tared filter, after thorough cooling, to allow the condurangine precipitated by heat to redissolve. The resinous precipitate thus thrown out is collected, washed, dried, and weighed. To the filtrate and washings 150 drops or more of a 4 per cent. solution of tannin is then added. The precipitated tannin-alkaloid compound is then collected, washed, dried, and also weighed. The amount of the latter obtained from the fluid extract, prepared with alcohol 45 per cent., was 3·65 per cent., compared with 1·46 and 1·8 per cent. obtained with the Swiss and German official menstrua. Alcohol 60 per cent. gave a result almost as high in alkaloid, but containing more resin, so that the fluid extract prepared with it was not permanently bright.

Creosotal Emulsion, Permanent. (*Amer. Drugg.*, xxxvii. 218.) Powdered acacia, 20 parts; sweet almond oil, 40; creosotal, 20; water, 60; lemon juice, 10; Peru cognac, 50. Place the acacia in a large mortar, weigh out the oil, the creosote and 45 parts of the water, and add them gradually to the acacia, agitating the mixture constantly. This forms a complete emulsion, to which the remaining 15 parts of water and the Peru cognac and lemon juice are

then added. It is claimed by Zollner (*Süddeutsche Apoth. Zeit.*) that this will remain unchanged for a week.

Epicarin; Pharmaceutical Formulæ for Preparations of. (*Merck's Report*, viii. 1900, 92.) *Ointment for Scabies*—Epicarin, 75 to 105 grains; white wax, 30 grains; white vaseline, 1 oz.; lanoline, ½ oz.; lard, 1½ ozs.

Application for Itching—Epicarin, 150 grains; ether and rectified spirit, of each, 1 fl. oz., 160 ♏; glycerin, 80 ♏.

Ointment for Prurigo—Epicarin, 150 grains; cod liver oil, 80 ♏; yellow vaselin, 3 ozs.

Inunction for Herpes Tonsurans—Epicarin, ½ oz.; soft soap, 6 ozs. 5 drs.; zinc oxide, 150 grains.

Ointment for Scaly Eczema—Epicarin, ½ oz.; flowers of sulphur, 75 grains; zinc ointment, 3¼ ozs.; oil of neroli, 1 drop.

Ferrated Cod Liver Oil. (*Journ. Pharm. d'Anvers*, lvi. 465.) Solution of ferric chloride is precipitated with excess of solution of sodium benzoate, the precipitate is collected, drained, and washed. Twenty parts of the moist magma is mixed with sufficient anhydrous sodium sulphate to produce a dry powder. This is digested with cod liver oil, 100, at a temperature not exceeding 32° C. Ferric benzoate is dissolved while sodium sulphate remains insoluble. The oil is then filtered, yielding a clear, somewhat dark preparation. It is diluted for use with from 4 to 9 parts of cod liver oil.

Formulary of Unofficial Preparations of the Victorian Pharmaceutical Association. (*Australas. Journ. Pharm.*, xvi. 25.) *Syr. Hypophos. Co.*—℞. Calcii hypophos., ʒi., gr. iv.; potass. hypophos., ʒii., gr. viii.; sod. hypophos., ʒii., gr. viii.; strychninæ hydroch., gr. iv.; ferri pyrophos., ʒi.; quin. hydrochlor., gr. xxxii.; sacch. alb. xtal., q.s. Dissolve the first three ingredients in the smallest quantity of cold water, the ferri pyrophos. in ℥i. of warm water, mix the solutions and filter through kaolin. Dissolve the quinine and strych. hyd. in ℥i. diluted alcohol. Make a strong syrup to allow for solutions, and clarify by white of an egg or felt filtering bag (and kaolin), and add enough syrup to produce ℥lxiv. of syrup.

Syr. Quininæ Hydrobrom.—℞. Quininæ hydrobrom., gr. lxxx.; ac. hydrobrom. dil., ʒiii.; syrup aurantii (B. P., 1898), ad ℥x. Dose—ʒi. to ʒii. in water.

Mist. Pepsinæ Co. c. Bismutho.—℞. Pepsin (scales 1–3000), gr. cclvi.; tr. nucis vom. (B.P., 1898), ʒx., ♏xl.; ac. hydrocyan. dil., ʒiv., ♏xvi.; liq. carmini, ℥ss.; aq. puræ, ℥viii.; liq. bismuthi,

ad ℥xvi. Dissolve the pepsin in the water, and add the liq. carmini last. Filter through talc if necessary. Each ʒi. dose contains:—Pepsin, gr. ii.; tr. nuc. vom., ♏v.; ac. hydrocyan. dil., ♏ii. Dose—ʒss. to ʒi. in water.

N.B.—Liq. carmini must be filtered perfectly bright before use.

Liq. Carmini.—℞. Carmini, gr. xx.; liq. ammon. fort., ♏xx.; glycerini, ʒi.; alcohol 90 per cent. vel sp. v. rect., ʒi.; Aquæ, ad ℥i. Dissolve carmine in water and ammonia, filter, and add glycerin last.

Liq. Pepticus.—℞. Pepsin (scales 1–3000), ʒiv.; ac. hydrochlor. dil., ʒiii.; glycerini, ℥iii.; alcohol (90 per cent.), ℥i.; ess. rennet, ℥viii.; aq., ad ℥xx. Dose—ʒi. Filter through talc if necessary.

Essentia Rennet.—℞. Rennet (freed from salt and chopped fine), ℥vi.; salt, ℥iv.; alcohol 90 per cent. or s. v. rect., ℥x.; aq., ad ℥xl. Macerate four days, add vin. xericum ℥v. After a day or two strain, and then add:—Glyc. ac. tannic., gtt. x.; fuller's earth, ℥i. Shake, and set aside for a week. Decant clear sol. and filter the sediment.

Vin. Pepsinæ.—℞. Pepsin (scales 1–3000), gr. cxxviii.; glycerini, ℥i.; acid. hydrochlor. (fort.), ʒss.; vin. xerici, ad ℥xvi. Mix the water, glycerin, and acid. Add the pepsin, and when dissolved add enough wine to make ℥xvi. Filter through talc.

Liq. Euonymin c. Pepsin.—℞. Tr. euonymi., ℥iiss.; pepsin (scale 1–3000), ʒiv.; ac. hydrochlor. dil., ʒiii.; glycerini, ℥iii.; aq., ad ℥xx. ʒi. for a dose.

N.B.—Tr. euonymi is thus prepared.

℞. Cort. rad. euonymi., 4 ozs.; alcohol 90 per cent. vel. s. v. r., ad ℥xx. (bark in 20 powder, and percolate).

Mist. Tussi Rub. Conc.—℞. Ac. hydrobrom., ♏xv.; tr. chlorof. et morphinæ (B.P., 1898), ♏vi.; liq. carmini, ♏ii.; ac. hydrocyan. dil., ♏i.; syri. pruni virg., ad ʒi. Dose—ʒi. to ʒii.

N.B.—Let stand for a day, then filter through paper.

Liq. Copaibæ (Soluble).—℞. Balsam copaibæ, ℥xx.; liq. potassæ, ℥xxx.; aq., ad ℥x. Boil copaiba and potash for an hour; add the water and mix thoroughly; set aside till cold and well separated; draw off clear liquid from upper oily portion and sediment, and evaporate to ℥xxxviii.; add liq. potass. ℥ii.

Mist. Bromoformi.—℞. Bromoformi, ♏xvi.; alcohol 90 per cent. vel. s. v. r., ʒii.; tr. card. co., ʒii.; glycerini, ℥iss. Dose (to be gradually increased)—ʒi. every four hours for whooping cough of children one to three years of age.

Elixir Calisaya.—℞. Tr. cinchonæ, ℥iii.; syr. simp., ℥iiss.; glycerini, ℥iiss.; syr. aromat., ℥xx. Mix and filter through a wet paper filter.

Liq. Santal Flav. Co. (*Soluble*).—℞. Ol. santal. flav., ʒii.; ol. cubebæ, ℥i.; ol. copaibæ, ʒvi.; ol. pimentæ, ʒss.; ol. cassiæ, ʒss.; tr. buchu, ℥vi.; inf. buchu conc. (1 to 7), ℥vi.; alcohol 90 per cent. vel. sp. v. rect., ℥viii.; liq. potassæ, ℥vi.; mag. carb. levis, ℥i.; aq. dest., ℥iii. Boil the liq. potassæ, mix with the oils, and stand for two days; add the water, and shake well (if not saponified boil up with a little more KOH); when cold add tinct., inf., and alcohol, add mag. carb.; mix well and in twenty-four hours filter through filter paper sprinkled well with mag. carb.

Emulsio Ol. Morrhuæ (*C. Hypophosphitibus, Ovis et Vino*).—℞. Ol. morrhuæ, ℥viii.; ovi. vitelli, ii.; p. tragacanth, gr. viii.; liq. saccharini, 5 per cent., ʒi.; tr. benz. simp., ʒi.; sp. chlorof., ʒiv.; ol. amygd. ess., ♏viii.; sodii hypophos., calcii hypophos., aa., ʒi.; vin. xerici, q.s., ad ℥xvi. Place tragacanth in dry mortar, rub with a little oil, then add the yolks of eggs (previously beaten), stir briskly, add wine and oil alternately until quantity is made up. Dissolve the hypophosphites in the wine.

N.B.—Can be dispensed at counter in fifteen minutes.

Liq. Thymol Co. (*Listerine*).—℞. Thymol., ʒii.; ac. benzoic., ʒvi.; eucalyptol, ʒss.; ol. gaultheriæ, ♏xx.; menthol, ʒi.; solve in alcohol 90 per cent. vel. sp. vini. rect., ℥xx.; aq. puræ, ad ℥c.; solve in aq., sod. bibor., ac. boric aa., ℥i. Stand for a few days, then filter through talc.

Elixir Cascaræ c. Glycerino.—℞. Ext. cas. sag. liq., ℥xxx.; ext. glycyrrh. liq., ℥xxx.; glycerin, ℥xxv.; saccharin (soluble), gr. cclxxx.; ol. anisi., ♏xx.; ol. menth. pip., ♏xx.; ol. anethi, ♏x.; ol. caryoph., ♏x.; ol. cinnam., ♏x.; alcohol 90 per cent. vel. sp. v. rect., ℥i. Dissolve the oils in the alcohol, and add to other ingredients. Dose—ʒi. to ʒii. as a laxative, or ʒss. t.d.s. Syn., Cascara aromatic.

Throat Sprays.—No. I.—℞. Iodi (pur.), gr. i.; menthol., ʒi.; ol. petrol. alb., ad ℥i. Dissolve iodine in the oil with heat and add menthol while warm. No. II.—℞. Guaiacol., ♏x.; menthol., ʒi.; ol. petrol. alb., ad ℥i. No. III.—℞. Cocain. (alk.), gr. x.; menthol., ʒi.; ol. petrol. alb., ad ℥i. Antiseptic stimulant and sedative for inhalation in phthisis, and in excessive muco-purulent discharge from bronchial tubes. No. IV.—℞. Menthol., gr. xxx; cocain. hyd., gr. v.; tr. benz. co., ℥i.; glycerini, ad ℥ii. Sedative and demulcent, useful in bronchial congestion and irritation (acute

or chronic), irritable cough generally. No. V.—℞. Cocain. hyd., gr. iii.; menthol., gr. x.; tr. aurant., ʒiii.; glycerin., ad ℥i. For hay fever, irritable catarrhal state of the pulmonary mucous membrane. No. VI.—℞. Ol. eucalypt., ♏xx., thymol., gr. iii.; menthol., gr. xxv.; ol. gaultheriæ, ♏vii.; ac. boric., gr. vii.; glyc. ac. tannic., ʒiii.; alcohol 90 per cent. vel. sp. v. rect., ad ℥ii. For relaxed sore throat, granular pharyngitis and chronic laryngitis and loss of voice, and all throat troubles.

Liq. Opii Sed.—℞. Opium (10 per cent. of morphine), ℥ii.; slaked lime, ʒii.; sp. vini rect., ℥iv.; vin. xeric., ℥iii.; aq., q.s. Boil the opium (broken into small pieces) and lime in 15 ozs. of water for half an hour, and allow to cool. Make up to 13 ozs. with water; add the s. v. r. and sherry. Filter, press the marc, and add proof spirit to make ℥xx. Set aside for six months to mature; filter. By letting it stand for the time mentioned the flavour and aroma are greatly improved.

Glycerin of Boric Acid. David Gilmour. (*Pharm. Journ.* [4], xii. 54.) The official formula is criticised as being tedious and unnecessarily complicated, giving an inelegant product, which, from its viscosity, fails to give a satisfactory result when it is painted on the mucous membrane of the throat. A simple solution of boric acid in glycerin, 1:4 or 1:5, would probably be preferable from a therapeutic point of view; it is certainly a more elegant pharmaceutical preparation.

Glycerin Suppositories. L. E. Sayre (*Drug. Circular*) gives the following modification of the U. S. P. method of preparing glycerin suppositories. Glycerin 300 is heated on the water bath with sodium carbonate 6 until the salt is dissolved. Stearic acid 10 is then added, and the heat continued until gas ceases to be evolved. The mass is then poured into suitable moulds. The suppositories should be stored, preferably without previously wrapping, in glass tubes. If wrapped at all, strong parchment paper should be used in preference to tinfoil, as the latter is objectionable. The suppositories should be freshly prepared.

Glycogenal. (*Merck's Report*, viii. 1900, 106.) This body, which according to Roerig is, like glycogen, a natural constituent of healthy tissue, but disappears almost entirely from the system in a diseased condition, has been employed in medicine in a number of affections. In phthisis it stimulates the appetite in a remarkable manner; it is also useful in inoperable carcinoma, relieving the pain, lessening the discharge and improving the general health. Although it may be given in large doses without harm, it is usually

found to be extremely active in minute quantities when administered hypodermically; in this case as little as $\frac{1}{3}$ grain will give good results. It is prescribed in the following forms: *Injections.*—(1) Glycogenal 3 grains, sterilised distilled water 160 ♏. Two c.c. (32 ♏) to be injected once daily with a syringe furnished with a wide-bore canula. (2) Glycogenal 45 grains, sterilised distilled water 2 fl. ozs. To be injected at once in grave septic fevers and advanced phthisis. *Enema.*—Glycogenal 30 grains, ammonium carbonate $7\frac{1}{2}$ grains, distilled water $2\frac{1}{2}$ fl. ozs. *Pastilles.*—Glycogenal 75 grains, ammonium carbonate 45 grains, soluble saccharin $1\frac{1}{2}$ grains, cacao paste 120 grains. Mass into 10 pastilles. One or two to be taken daily. *Capsules.*—Glycogenal, creosote valerianate, of each 5 grains. One capsule to be taken morning and evening. Glycogenal is a whitish, odourless and tasteless powder, soluble in water.

Hedonal Mixture. (*Merck's Report*, viii. 1900, 115.) When hedonal is required to be dispensed in the form of a solution, this may be obtained by the formula of Schlueter. Hedonal 90 grains, dilute alcohol (68 per cent.), syrup of cinnamon, of each 1 fl. oz., oil of caraway 2 drops. One tablespoonful (22 grains of hedonal) for a dose.

Horsechestnut, Liquid Extract of. (*Pharm. Centr.*, xlii. 404.) Recent research has proved that the saponin constituents of horsechestnuts are possessed of very slight toxic properties. A fluid extract of the seeds in the form of a syrupy liquid has been employed in medicine with good results, in the treatment of rheumatism and neuralgias. Schuermeyer finds that this is quite free from irritating or toxic action when applied to the skin. It has also been employed as a gargle in the form of a 1 to 2 per cent. solution.

Iodic Acid as an Antiseptic and Caustic; Pharmaceutical Preparations of. (*Merck's Report*, viii. 1900, 48.) Schiele has employed hard and soft iodic rods for ophthalmic cautery; the former are prepared by rolling pure iodic acid, massed with a little water, into rods; the latter consist of a mass containing iodic acid 15 and powdered acacia 1. It is also employed for instillations, in the form of aqueous solution from 1 to 3 per cent. A 1·5 per cent. ointment is also prescribed. In diphtheria, alternate spraying the affected area of the throat with 3 per cent. hydrogen peroxide solution, and half an hour afterwards employing a 10 per cent. insufflation of iodic acid with milk sugar, is also recommended. In the interval between spraying and insufflating, the following gargle is prescribed. Iodic acid 8 grains, distilled water 14 fl. ozs., glycerin

400 ♏. The lips should be protected from the action of the acid by smearing them with vaseline before using the insufflation.

Iodised Meat Juice. Consolin Tamisier (*L'Union Pharm.*, xlii. 97) advocates the use of a dilute aqueous solution of iodine to prevent putrefaction in the domestic preparation of meat juice. He contends that the presence of a minute trace of iodine in the finished product is harmless, if not beneficial, since by its intimate combination with the albuminoids its therapeutic action is much modified. He recommends that in the preparation of the juice, a solution of iodine 0·2 in 1,000 should be employed instead of water.

Iodised Meat Powder. Consolin Tamisier (*L'Union Pharm.*, xlii. 97) finds that when 20 parts of dry meat fibrin is heated with one part iodine on the water bath, until a portion withdrawn no longer gives a yellow solution with alcohol (90 per cent.), a very intimate combination of the metalloid with a portion of the organic matter takes place. This iodised body is completely extracted by boiling water, but strong acids do not decompose the soluble iodine compound thus obtained. It only liberates iodine on treatment with ferric chloride. This iodised meat powder is recommended as a substitute for both the organic and inorganic iodides employed in medicine.

Iodised Oil. Lafay. (*Bull. Com.*, xxix. 276.) By the action of hydriodic acid on poppy seed oil, a combination of iodine with the fatty acids of the oil has been obtained, which contains 40 per cent. of iodine. It is introduced as a substitute for iodipine, which being made by the action of iodine chloride on sesame oil, contains chlorine as well as iodine. This iodised oil is lighter in colour than iodipine, although it contains more iodine. A combination of mercuric iodide with the same oil has been named "di-iodized oil." It contains one centigramme of mercuric iodide in the c.c. It is intended for use, combined with iodized oil, for injections.

Ipecacuanha Preparations, Stability of. H. Wippell Gadd (*Chem. and Drugg.*, lviii. 21) is unable to confirm the statement of Glode-Guyer (Year-book, 1900, 196), as to the diminution by keeping of alkaloids in the official preparations of ipecacuanha. A fluid extract made and standardized in February, 1900, showed the same amount of alkaloid in the following June. The wine made from this extract and filtered in March yielded 0·102 per cent. of alkaloids in June. The same wine, not filtered in March, gave in the following December 0·1 per cent. of alkaloids.

Vinegar of ipecacuanha made in March, 1890, yielded 0·103 per cent. of alkaloids in the following December.

Liquor Ferri Mangani-Iodo-Saccharati. (*Pharm. Central.*, xlii. 39.) Sodium iodoalbuminate (α-eigone) 2 is dissolved in liquor ferri manganati 998.

Liquor Ferri Peptonati c. Quinina. (*Pharm. Central.*, xlii. 39.) Iron peptonate 16, is dissolved in water 700, with gentle heat. Quinine sulphate 5, is dissolved in alcohol (90 per cent.) 75, and brandy 100. The two solutions are mixed and simple syrup 100, tincture of orange 3, aromatic tincture (Ph. G.) 1·5, vanilla tincture 1·5, and acetic ether 0·2, are added.

Liquor Ferro-Mangani Peptonati. (*Pharm. Central.*, xlii. 39.) Iodo-peptone (β-eigone) 2, dissolved in solution of liq. ferri mangano-peptonate 998.

Liquor Thiocol. (*Pharm. Central.*, xlii. 39.) Thiocol 10, is dissolved in water 45, and syrup of orange 95.

Menthol-Orthoform Emulsion for Laryngeal Tuberculosis. (*Therap. Monats.*, xv. 152.) Menthol, 1, 5, or 15; oil of sweet almonds, 30; yolk of egg, 25; orthoform, 12; distilled water, q.s. to produce 100. For an emulsion.

Diluted Ointment of Mercuric Nitrate. G. F. Merson. (*Pharm. Journ.* [4], xii. 211) suggests the substitution of white instead of yellow soft paraffin as the diluent. The product is more elegant in appearance and possesses better keeping properties.

Muscular Juice, Preparation of. A. Lambotte. (*Journ. Pharm. d'Anvers*, lvii. 81.) 4·5 kilos. of minced raw meat is treated with half its weight of water, macerated for three hours, then pressed strongly. By employing an equal weight of water, a product slightly lower in sp. gr. and ash is obtained, and even a second maceration does not entirely exhaust the meat. Where the press is not available, an almost equal yield may be obtained by draining the maceration through a very fine sieve, supported over a dish.

Naftalan Suppositories. M. Rauch. (*Deutsch. Med. Woch.*) The author prescribes a suppository containing 20 per cent. of naftalan to be used at bedtime, for the relief of hæmorrhoids. The basis recommended consists of cacao butter 3, and yellow wax 1.

Ointments from the Hamburg Unofficial Formulary. (*Amer. Drugg.* xxxviii. 39.) The medical society of Hamburg recently published a formulary of unofficial preparations from which the following formulæ are taken. *Zinc oxide paste.*—Infusorial

earth, 5 parts; zinc oxide, 25; benzoated lard, 70. *Soft zinc paste.*—Precipitated calcium carbonate, 25; zinc oxide, 25; linseed oil, 25; lime water, 25. *Compound zinc paste.*—Zinc oxide paste, 50; soft zinc oxide paste, 50. *Compound chrysarobin ointment.*—Salicylic acid, 2; chrysarobin, 5; ichthyol, 5; petrolatum, 88. *Compound pyrogallic ointment.*—Salicylic acid, 2; pyrogallic acid, 5; ichthyol, 5; petrolatum, 88. *Compound resorcin ointment.*—Salicylic acid, 2; resorcin, 5; ichthyol, 5; petrolatum, 88.

Nux Vomica Extract, Removal of Fixed Oils from, by means of Paraffin Wax. F. A. Lieker advocates (*Pharm. Review*, xix. 56) the use of solid paraffin instead of ether as a solvent for the fixed oil, in the process of preparing fat-free nux vomica extract. The powdered drug is extracted by the U.S.P. menstruum, and to every 550 parts of aqueous residue left after recovery of the alcohol by distillation, 40 parts of paraffin wax is added and the whole warmed to 70 or 80° C. and well agitated at frequent intervals for half an hour. The melted paraffin is then allowed to rise completely to the surface: the mixture is then cooled, and the solid paraffin removed: the process is repeated, using a smaller quantity of paraffin wax. After removal, the congealed wax layers are melted and washed with water, acidulated with a little acetic acid, the washings being returned to the original aqueous extract. This, on evaporation at 65° C. on the water bath, yields a brittle fat-free extract, which readily powders, and keeps well in the powdered condition, both alone and when mixed with milk sugar. In addition to fat, paraffin appears to remove small amounts of two or three brown and black inert bodies, which are not removed by ether. The amount of alkaloids in the extract is not affected by this paraffin treatment.

Ointments, Preparation of. A. I. Cohn. (*Merck's report*, 1900, through *Pharm. Journ.* [4], xi. 216.) Lard should be prepared by the pharmacist himself. The product obtained by the following method is greatly superior to the lard purchased from the wholesale dealer.

Secure any suitable quantity of the abdominal fat of the hog, and cut up into small pieces. After freeing these, so far as is possible, from the membranous parts, wash them thoroughly in a liberal allowance of very luke-warm water, until practically all soluble substances present have been washed out. Then introduce the fat, together with a little water, into a suitable vessel, preferably of the kind known as "enamelled" or "granite" iron, and

heat over a naked fire until all the fat has been melted. As the water evaporates it should be replaced, otherwise there is danger of the fat becoming too highly heated, and thus acquiring more or less colour, and, perhaps, an unpleasant odour. The writer has found it advisable to add to the melting fat a few pieces of peeled, raw potato, as the final product is thereby greatly improved. In fact, lard which has already become partially rancid may frequently be reclaimed and made perfectly sweet, or, at least, very greatly improved, by remelting it with a few pieces of potato, and continuing the heat until the pieces have become crisp or "fried."

Too great a heat must be carefully avoided in order to prevent the possible discoloration above noted. If desired, the fat may be tried out on a water-bath, in which case it will not be necessary to add any water to the fat.

The melted fat is allowed to stand for ten or fifteen minutes, and is then strained through a piece of cloth, preferably of flannel. The water present will have settled out during the standing, and may be readily removed after the lard has solidified.

The product, when cold, should be transferred to stone-ware jars, care being of course taken not to incorporate any of the separated water. The jars should be well covered and kept in as cool a place as possible. To further protect the lard from undue exposure to air, and consequent rancidity, it is well to pour a layer of water or glycerin about an inch in depth on the surface of the lard.

Lard so prepared and kept has a peculiar firmness, crispness, and pleasant odour, which are entirely lacking in the article bought ready-made. It is not nearly so prone to become rancid, and ointments prepared from it are superior in every respects.

So far as the incorporation of medicinal substances with lard is concerned, this must be varied according to the nature of the substance.

Zinc ointment is best prepared by the following method. Triturate the zinc oxide with a little alcohol, which promptly breaks up all lumps; then add a little castor oil, and continue the trituration until the mixture is perfectly smooth, and no gritty particles are felt under the pestle. To this mixture is now added the benzoated lard, previously melted on a water-bath, and stir until cold, frequently scraping the sides of the mortar with a flexible spatula. It sometimes happens that some gritty particles are encountered in the zinc oxide used, which are not reduced by the alcohol, and which cannot be all crushed by the pestle. In this case it is necessary to strain the still fluid mixture of zinc oxide

and lard through a piece of cheese cloth. This procedure will, however, rarely be necessary if a good quality of zinc oxide has been employed. The little alcohol used is rapidly driven off by the heated lard during the trituration; the small quantity of castor oil can scarcely be objected to, as in the proportion present—about 4 to 5 fluid drachms to the pound of ointment—it has no action even on the most sensitive skin.

Benzoated lard is another ointment which presents difficulties in the way of obtaining a nice product. The pharmacopœial process is not a perfectly desirable one, inasmuch as a prolonged heat (two hours) is necessary for the complete exhaustion of the benzoin, because the latter cakes together and becomes hard. The process used by the writer has given most excellent results, and its use for a long time has demonstrated its efficiency. It is as follows:—

Prepare a concentrated tincture from the benzoin ordered, and pour it over some clean, washed, and well-dried gravel, evaporate the solvent, and then inclose the benzoin-bearing gravel in a piece of suitable fabric—woollen cloth, muslin, cheese cloth, etc. Suspend the bag thus made in the lard heated on a hot-water bath, and retain it there until benzoination is complete. This takes place much more rapidly than with the official process (usually 30 minutes is ample), because a far greater surface of benzoin is exposed on the gravel to the solvent action of the hot fat. Further, an advantage is gained in not having to keep the lard hot so long as to endanger its keeping qualities.

Ointments containing extracts such as of opium, belladonna, aconite, stramonium, etc., are best prepared as follows:—Heat the extract in a porcelain evaporating dish on a water-bath with a mixture of equal parts of diluted alcohol and glycerin, until the extract has been dissolved, and the alcohol and water practically all evaporated. Then incorporate the glycerinic mixture with the fat. Ointments so made keep far better than when made by triturating aqueous or hydro-alcoholic solutions of an extract with the fat.

In preparing such ointments as those of ammoniated mercury, lead carbonate, lead iodide, etc., it will be found that a very little expressed oil of almonds will very materially assist in securing perfectly smooth ointments if the powders are first triturated with it.

Ointments of both yellow and red mercury oxides should be prepared by first triturating the oxides with a little glycerin, to which just enough alcohol has been added to overcome the vis-

cosity—say, about one-tenth. The glycerin enables the powders to be more finely triturated than can be accomplished by water or alcohol alone, or by the ointment base, and secures more permanence for a product, which is, at best, very prone to spoil quickly. The very little alcohol is usually entirely dissipated during the trituration.

To obtain a fine, smooth cold cream the manipulation is almost of more importance than the formula followed. The following process has always yielded an excellent product: Spermaceti, 2 troy ozs.; white wax, 2 troy ozs.; expressed oil almond, 12 fl. ozs.; water, 4 fl. ozs.; borax, 1 dr.; oil of rose, 20 drops.

Melt the spermaceti and wax in the oil on a steam-bath, taking care not to expose the mixture to heat any longer than is just enough to effect liquefaction of the solids. Pour this solution into a *cold*, *capacious* mortar, and immediately add the water, previously warmed, and in which the borax has been dissolved, pouring it in a steady stream into the centre of the oily solution, and without stirring. When all has been added, the whole is thoroughly mixed with the pestle, care being taken to frequently scrape the sides of the mortar and incorporate the firmer with the more fluid portion. When the ointment has become fairly solid, which occurs in but a very short time, scrape the sides of the mortar well, and get all the ointment together, then cover the mortar, and set aside for a few hours. When perfectly cold and the ointment has "set," add the oil of rose, and triturate until a perfectly smooth preparation results.

In very hot weather the quantity of wax and spermaceti should be somewhat increased, say about one-eighth, and in very cold weather diminished.

Ointment Basis, a new. H. Forster. (*Pharm. Journ.* [4], xii. 694.) A mixture of equal parts of lard, anhydrous lanoline and vaseline melted together, strained and allowed to cool without stirring, is found to give a useful basis, which is suitable for use with most drugs.

Ointments of the Philadelphia German Hospital Pharmacopœia. (*Amer. Journ. Pharm.*, lxxii. 518.) *Ointment of boric acid.*—Boric acid 100; petrolatum 900. *Ointment of carbolic acid.*—Carbolic acid 50; petrolatum 950. *Ointment of rose water.*—Spermaceti 125; white wax 120; oil of cotton seed 600; sodium borate 5; distilled water 190; oil of rose 2 drops. *Belladonna ointment.*—Alcoholic extract of belladonna leaves 100; diluted alcohol 50; petrolatum 850. *Ointment of belladonna and*

mercury.—Belladonna ointment 500; mercurial ointment U.S.P. 500. *Nutgall ointment.*—Nutgalls in fine powder 200; petrolatum 800. *Ointment of galls and opium.*—Powdered opium 5; nutgall ointment 95. *Ointment of ammoniated mercury.*—Ammoniated mercury 100; petrolatum 900. *Ointment of yellow mercuric oxide.*—Yellow mercuric oxide 20; petrolatum 980. *Ointment of red mercuric oxide.*—Red mercuric oxide 100; petrolatum 900. *Iodine ointment.*—Iodine 40; potassium iodide 10; water 10; petrolatum 940. *Iodoform ointment.*—Iodoform 100; petrolatum 900. *Tar ointment.*—Tar 250; petrolatum 250. *Ointment of lead iodide.*—Lead iodide 100; petrolatum 900. *Ointment of potassium iodide.*—Potassium iodide 100; water 50; petrolatum 850. *Stramonium ointment.*—Extract of stramonium 100; diluted alcohol (49 per cent.) 50; petrolatum 850. *Sulphur ointment.*—Sublimed sulphur 300; petrolatum 700. *Ointment of turpentine.*—(Compound resin cerate) resin 240; yellow wax 240; petrolatum 300; oil of turpentine 120; linseed oil 100. *Ointment of zinc oxide.*—Zinc oxide 200; petrolatum 800. *Ointment of zinc and ichthyol.*—Ichthyol 50; ointment of zinc oxide 950.

Oleates Official and Unofficial. W. A. H. Naylor (*Pharm. Journ.* [4], xii. 392) gives the following processes for the preparation of the most generally used oleates. The soap employed should be genuine olive oil soap containing about 15 per cent. of water.

Aluminium oleate.—1 oz. of pure potassium alum is dissolved in 6 fluid ozs. of boiling water, and poured, with stirring, into a solution consisting of 2 ozs. of soap dissolved in half a pint of boiling water. The precipitate, which is clotty, is washed with boiling water by decantation, until free from sulphates, and dried over a water-bath. The oleate is of a yellowish-grey colour, opaque, adhesive and weighs about 2¼ ozs. On ignition it yields 6 per cent. of oxide, equivalent to 3·2 per cent. of aluminium. If it is desired to obtain the oleate in an anhydrous condition, exposure to a temperature of 120° C. is necessary. For making the ointment, it is sufficient to take the oleate as dried on a water-bath.

Bismuth oleate.—1 oz. of bismuth subnitrate is dissolved by the aid of heat in 5½ fluid drachms of nitric acid, diluted with its own volume of distilled water. It is then further diluted with three times its volume of distilled water, and poured while hot, with stirring, into a hot solution, consisting of 3 ozs. of soap in 24 ozs. of water. The precipitate is washed with hot water by decantation, and dried over a water-bath. The yield of the dried oleate, which is of a light citron colour, is about 3 ozs. On ignition it yields

bismuth oxide 22 per cent., equivalent to 20 per cent. of metallic bismuth.

Copper oleate.—1 oz. of pure crystallised copper sulphate is dissolved in 5 fluid ozs. of water and poured, with stirring, into a solution consisting of $2\frac{3}{4}$ ozs. of soap in one pint of water, and the mixture heated to boiling. The resulting precipitate, which at first is flocculent, gradually aggregates, and, if the heat be maintained, it separates out in a short time in the form of a plaster. When completely washed, kneaded, and dried over the water-bath, it is of a dark green colour, somewhat opaque, toughly brittle, and weighs $2\frac{1}{2}$ ozs. It yields on ignition 11·6 per cent. of oxide, equivalent to 9·3 per cent. of metallic copper.

Ferrous oleate—This oleate partakes of the instability which characterises many ferrous salts. The water used, whether as a solvent or for washing purposes, should be freed from dissolved oxygen by prolonged boiling; precipitation should be effected in a vessel that can be stoppered, and of a size not larger than suffices to contain both the precipitate and liquid. Moreover, the whole process should be carried out with all possible speed.

To expedite the latter stages of the processes, the precipitated oleate, when sufficiently washed, should be thrown on calico, squeezed, and then subjected to strong pressure. The pressed cake in its unbroken state should be dried at a temperature not exceeding 50° C. For the production of the oleate the proportion of pure crystallised ferrous sulphate and hard soap are 1 oz. of the former, dissolved in 5 fluid ozs. of water, and 2 ozs. of the latter, dissolved in 16 fluid ozs. of water.

In spite of these precautions the oleate will be found to have undergone considerable oxidation.

Ferric oleate.—Unlike the ferrous oleate, this can be easily and quickly prepared through the interaction of ferric acetate and soap. Suitable proportions are 4 fluid ozs. of solution of acetate of iron (B.P. 1898) and $2\frac{1}{2}$ ozs. of soap, dissolved in 16 fluid oz. of boiling water. The precipitate, previously washed with hot water, when dried on a water-bath, is of a deep red colour, and weighs a little over 2 ozs. On ignition, it yields 8 per cent. Fe_2O_3, equivalent to 5·6 per cent. of metallic iron. It is readily soluble in the fixed oils. Advantage may be taken of this fact when it is required to adminster cod liver oil in association with iron.

Lead oleate.—The following process is that of the "National Formulary": 3 ozs. of lead acetate are dissolved in 160 fluid ozs. of water, and the solution cleared by the addition of a few drops of

acetic acid; 5 ozs. of soap are dissolved in 80 fluid ozs. of water, and into it is poured, with constant stirring, the lead solution. The mixture is heated to boiling point, the precipitate washed with hot water by decantation, and occluded water removed by pressure. When dried over a water-bath the oleate is of a dirty grey colour, strongly adhesive, and weighs about 5½ ozs. On ignition, it yields 25 per cent. of lead oxide, as against the "about 28 per cent." of the "National Formulary." Lead plaster taken from stock gave an amount of lead corresponding to 28 per cent. of oxide.

Mercuric oleate.—The author adversely critises the official formula for this preparation. He finds no advantage in the precipitation method now official, over that of solution of the oxides as formerly prescribed. In the older method the strength of the product in mercuric oxide was at once apparent, whereas there is no definite statement on this head in the present work. The expression "powdered soap" is considered to be indefinite; the addition of oleic acid is of little, if any, advantage, and the directions for drying on the water-bath unsatisfactory. It is found that in three hours a well-drained specimen only lost 3 per cent. by weight on the water-bath, that it separated into two layers, the upper of a transparent amber colour, and the lower greyish and opaque. The amount of mercury in these two layers was found to be 17 per cent. for the upper, and 34 per cent. for the lower layer. The amount of mercuric chloride is in excess of the theoretical requirements. A larger yield of oleate, closely approximatory to the theoretical yield, may be obtained by slightly increasing the amount of soap. The official oleate was found to contain 23 per cent. of metallic mercury, equivalent to 24·35 of mercuric oxide. This was determined by the following process, which is Bennett's with a modification, is cleanly, easy of manipulation, and gives good results. About 2 Gm. of the oleate is weighed into a small tared beaker and stirred with 10 c.c. of ether until completely disintegrated; 25 c.c. of alcohol and 5 c.c. of hypophosphorous acid (30 per cent.) are then added. The whole is then placed and retained on a water-bath until the reduced mercury completely subsides, leaving the fatty matter in solution. The liquid is poured off and the precipitate washed by decantation successively with alcohol and ether. Finally, the beaker and mercury are dried at 100° C. and weighed.

Zinc oleate.—No weight of product is appended to the official process; with the quantities given in the Pharmacopœia this will be 3½ ozs., yielding on ignition 11·59 per cent. of ZnO. Theoretically normal zinc oleate contains the equivalent of 12·9 per cent.

of ZnO. The amount of zinc sulphate prescribed is in excess of theoretical requirements. The oleate prepared by precipitation possesses the advantage over that obtained by direct combination of zinc oxide and oleic acid, in that it can be readily reduced to powder.

Paraform collodion. Unna (*Monats. für Prakt. Derm.*, through *Merck's Report*, viii. 1900, 161) recommends the following application for saprophytic affections of the skin. Paraform in very fine powder 30 grains, spirit of ether 32 ♏, flexile collodion 4 fl. drs. To be applied with a brush for two or three days to the affected area, which should then be covered with vaseline and allowed to desquamate. The part is then washed daily with superfatted formaldehyde soap.

Pepsin Elixir. (*Amer. Drugg.*, xxxvii. 307.) A good elixir of pepsin should be of such strength that one teaspoonful will digest 3,000 grains of egg albumin and curdle 2 pints of fresh milk. Such a preparation may be obtained as follows: Granular pepsin U.S.P., 512 grains; granular rennet (concent.), 512 grains; distilled water, 8 fl. ozs.; glycerin, 4 fl. ozs.; deodorized alcohol, 8 fl. oz.; detannated muscatel wine (domestic), sufficient to make 64 fl. ozs. Mix the water and glycerin, add the pepsin and rennet, and allow them to stand for three or four hours, until they are apparently dissolved. Then add the deodorized alcohol and sufficient wine to make 64 fl. oz. Mix with 1 oz. of talcum and allow to stand a week and filter. If a good grade of domestic muscatel wine, detannated with hydrated oxide of iron, be used, this preparation will be found very satisfactory. Sherry or sweet catawba wine can be used, but thirty minims of oil of orange should be added to improve the flavour. If it is not necessary, or desirable, to have a very light-coloured preparation, the wine need not be detannated, but most of the colour and tannin can be removed by mixing 2 fl. drs. of tincture of iron chloride with 48 fl. ozs. of wine, and adding 1 fl. oz. of fresh milk. Allow it to stand twenty-four hours, and filter through talcum before using in the elixir of pepsin. After the finished preparation is filtered it should be tested by adding a fluid drachm to 32 fl. oz. of fresh milk, previously warmed to 100° F., and stirring only sufficiently to mix. In fifteen minutes or so, a firm curd should be formed. If it fails, the rennet is at fault and is not strong enough for the purpose. An elixir made in this way will keep, and will not develop a disagreeable odour.

Petrolatum, Oygenated. M. G. Wilbert. (*Amer. Journ. Pharm.*, lxxiii. 220.) As a substitute for the "oxygenated" vasogen which is used widely in the Continent as a vehicle for skin medi-

cation the following preparation is of value: Liquid paraffin, 100; oleic acid, 50; spirit of ammonia, U.S.P., 25 (10 per cent. solution of ammonia gas in alcohol 94 per cent.). Mix. The resulting mixture is a yellow, oily liquid which readily dissolves iodine, salicylic acid, and many alkaloids; is readily miscible with other solvents, and forms a permanent emulsion with water. By substituting hard paraffin for the liquid variety, melting it in the oleic acid, and adding the spirit of ammonia just before the mass sets, finally stirring until quite cold, a solid form which is useful as an ointment basis is obtained.

Peru Cognac. (*Pharm. Centr.*, xlii. 40). Balsam of Peru, 25, is rubbed down with coarsely powdered pumice stone, 75, then with brandy, 1000, and the liquid portion filtered off.

Pilulæ Ferri c̄ Arsenio. (*Pharm. Centr.*, xlii. 39.) Arsenious acid 6 Cgm. Reduced iron 6 Gm. are massed with sufficient licorice extract and powdered licorice root and divided into 60 pills.

Pilulæ Ferri c̄ Quinina. (*Pharm Centr.*, xlii. 39.) Quinine hydrochloride 2 Gm. and reduced iron 8 Gm. are massed with sufficient gentian root powder and gentian extract and divided into 60 pills.

Pilulæ Ferri Lactici. (*Pharm. Centr.*, xlii. 39.) Iron lactate 9 Gm. is massed with sufficient licorice extract and powder, and divided into 90 pills.

Pilulæ Ferri Lactici c̄ Calcio Phosphorico. (*Pharm. Centr.*, xlii. 39.) Iron lactate 2·5 Gm., calcium phosphate 5 Gm., gentian extract 2 Gm. are massed with sufficient gentian powder, and divided into 60 pills.

Pilulæ Ferri Lactici c̄ Quinina. (*Pharm. Centr.*, xlii. 39.) Iron lactate 3 Gm., aqueous extract of cinchona 2 Gm., extract of nux vomica 30 Cgm. are massed with sufficient powdered gentian root and divided into 60 pills.

Pilulæ Ferri Peptonati. (*Pharm. Centr.*, xlii. 39.) Iron peptonate 5 Gm., gentian extract 3 Gm. are massed with sufficient gentian root and divided into 60 pills.

Phenol Soap Solutions. Triollet. (*Annales der Pharm.*, vii. 34, through *Pharm. Journ.*, iv. 12, 755.) Courtade has pointed out that soap increases, in a marked degree, the solubility of phenol in water. Triollet has investigated the matter, and finds that 1 litre of water containing 1 Gm. of soap will dissolve 90 Gm. of crystalline phenol; with 2 Gm. of soap the same volume dissolves 96 Gm. of phenol, with 4 Gm., 108 Gm. of the antiseptic. With 50 Gm. of soap, 1 litre of water dissolves 600 Gm. of phenol,

the volume of the solution being 1,500 c.c.; each 100 c.c. therefore contains 40 Gm. of carbolic acid. It is suggested that this should form the stock solution from which weaker mixtures might be prepared by diluting with a suitable quantity of water.

Posology, simplification of. L. Adrian. (*Bull. Gen. de Therap.*, cxli. 284, through *Pharm. Journ.* [4], xii. 423.) It is suggested that all the more potent drugs should be prepared and administered in the form of "therapeutic normal solutions, 1 c.c. of which shall contain the recognized maximum dose of the remedy." Thus, the therapeutic normal solution of aconitine nitrate (Codex) would contain 1 Mgm. of that salt for each c.c., that of morphine hydrochloride 1 Cgm., and so on. Since it is customary in Continental practice to prescribe these potent medicines to be taken in a certain number of drops, as measured by a drop pipette, it is necessary to employ a vehicle which will give a definite and not too great a number of drops to the c.c. Such a menstruum is afforded by the following mixture: Distilled water, 80 Gm.; alcohol, 90 per cent., 10 Gm., glycerin, 10 Gm. Thirty drops of this are equivalent to 1 Gm. or 1 c.c., since the mixture has the sp. gr. 1·000.

Rhubarb, Syrup of. G. F. Merson (*Pharm. Journ.* [4], xii. 208) finds that this syrup, when made up to the prescribed weight, has the sp. gr. 1·300, at which figure it does not keep well. By following the official process, making the syrup in the usual way, in an open pan, the product, at the completion of the solution of the sugar, weighed 2 lbs. 4 ozs., had a specific gravity 1·330, and kept perfectly. The author suggests therefore that the final weight of the syrup should be 2 lbs. 4 ozs., and not 2 lbs. 8 ozs., as at present prescribed in the official directions.

Solubilities of Chemicals Mentioned in the British Pharmacopœia. H. Greenish and F. A. Upsher Smith. (*Pharm. Journ.*, [4], xi. 190 and xii. 777, 806.) In view of the conflicting statements as to the solubilities of official salts, and the indefinite data in the official work on this important point, an elaborate series of experiments have been conducted to establish correctly the solubilities of the salts prescribed in the official work.

Temperature of Solution.

As standard temperatures both 60° and 62° F. have certain claims for recognition. The latter (62° F.) is the temperature at which imperial measures are graduated and at which specific gravities are often determined. On the other hand, the former (60° F.) is the temperature at which volumetric vessels and metric

measures are graduated; it is also the temperature at which specific gravities are officially directed to be determined; and it is, moreover, the temperature that has been adopted in at least one case—viz., paraldehyde—as that at which the solubility of the liquid is to be determined.

60° F. was therefore selected as the standard temperature, and a range of 2° above and below this temperature was allowed.

Methods of Determining Solubility.

The method of obtaining a saturated solution by dissolving excess of substance by means of heat and allowing the excess to separate by cooling was rejected, it being well known to be unreliable, owing to the danger of forming super-saturated solutions.

Two other principles may be adopted in determining the solubility of a substance—

(*a*) *The Direct Solution Method.*—A weighed quantity of the substance may be taken, and the amount of solvent necessary to dissolve it ascertained. This method is a useful one for such salts as are tolerably soluble and yield clear and colourless or not very deeply coloured solutions. It is an exceedingly useful check upon the solubility as determined by other means, and in all cases where one has approximate figures as a starting-point. But if used as a method of determining solubility, it has the disadvantage of being tedious, of being inapplicable for turbid or very highly coloured solutions, and of yielding approximate results only.

(*b*) *The Digestion Method* was selected as the most accurate and the most expeditious. Saturated solutions were obtained by agitating a suitable quantity of the substance with a quantity of solvent judged by the statements in the Pharmacopœia or other work to be insufficient to completely dissolve it. A large excess of undissolved substance was avoided because, as the substances are only "officially" pure, permissible traces of more soluble salts might, in some cases, apparently and unduly raise the percentage of matter dissolved if the substance containing them were itself less soluble than the impurity.

In order to afford a guide as to the progress of solution, it was determined to take the specific gravity of the strained saturated solution from time to time, for as long as the gravity increased, the temperature being constant, so long must the substance be passing into solution. As soon as the gravity showed little or no rise the solution was analysed.

The results obtained are thus summarised—

Name of Salt.	Temp. Fah. Deg.	Solubility found.	British Pharmacopœia.	German Pharmacopœia.	United States Pharmacopœia.
Ammonii Carbonas	62	1 of $N_3H_{11}C_2O_5$ in 3·94	1 in 4	about 1 in 5	1 in 5
Potassii Bicarbonas	61	1 of $KHCO_3$ in 3·21	1 in 4	1 in 4	1 in 3·2
Sodii Bicarbonas ...	60	1 of $NaHCO_3$ in 11·08	1 in 11	1 in 12	1 in 11·3
Potassii Carbonas...	60	1 of hydrous salt (containing 83·5 per cent. K_2CO_3) in 0·75	1 in 1	1 in 1	1 in 1·1
Sodii Carbonas ...	59	1 of $Na_2CO_3 10H_2O$ in 1·66	1 in 2	1 in 1·6	1 in 1·6
Lithii Carbonas ...	60	1 of Li_2CO_3 in 72·8	1 in 70	1 in 80	1 in 80
Ammonii Phosphas	58·5	1 of $(NH_4)_2HPO_4$ in 0·76	1 in 4	Not given	Not given
Sodii Phosphas	59	1 of $Na_2HPO_4 \cdot 12H_2O$ in 6·91	1 in 6	1 in 5·8	1 in 5·8
Potassii Nitras	60	1 of B.P. KNO_3 in 3·77	1 in 4	1 in 4	1 in 3·8
Potassii Permanganas	60	1 of $K_2Mn_2O_8$ in 18·7	1 in 20	1 in 16	1 in 16
Sodii Arsenas	60	1 of Na_2HAsO_4 in 4·88	1 in 6	Not given	1 in 4
Sodii Hypophosphis	60	1 of moist salt (containing 85 per cent. $NaPH_2O_2$) in 0·78	1 in 1	Not given	1 in 1
Sodii Nitris	60	1 of $NaNO_2$ in 1·36	Very soluble	Not given	1 in 1·5
Sodii Salicylas	59·5	1 of $(C_6H_4 \cdot OH \cdot COONa)_2H_2O$ in 0·88	1 in less than 1	1 in 0·9	1 in 0·9
Sodii Sulphis	60	1 of commercial salt (containing 93 per cent. $Na_2SO_3 7H_2O$) in 1·86	Readily soluble	Not given	1 in 4
Sodii Sulphocarbolas	58·5	1 of $C_6H_4OH \cdot SO_2 : ONa2H_2O$ in 5·48	1 in 6	Not given	1 in 4·8
Plumbii Acetas.....	60	1 of $Pb(C_2H_3O_2)_2 3H_2O$ in 2·37	1 in less than 3	1 in 2·3	1 in 2·3
Potassii Acetas.....	59	1 of commercial salt (containing 90 per cent. CH_3COOK) in 0·379	1 in 0·5	Not given	1 in 0·36
Potassii Chloras ...	60	1 of $KClO_3$ in 16·53	1 in 16	1 in 16	1 in 16·7
Potassii Bichromas	60·5	1 of $K_2CrO_4 \cdot CrO_3$ in 9·93	1 in 10	1 in 10	1 in 10
Ammonii Benzoas...	58	1 of B.P. $C_6H_5 \cdot COONH_4$ in 5·1	1 in 6	Not given	1 in 5
Sodii Benzoas	59·5	1 of commercial salt (containing 97 per cent. C_6H_5COONa) in 1·68	1 in less than 2	Not given	1 in 1·8
Borax	61·75	1 of $Na_2B_4O_7 10H_2O$ in 23·69	1 in 25	1 in 17	1 in 16
Potassii Sulphas ...	60·5	1 of K_2SO_4 in 9·65	1 in 10	1 in 10	1 in 9·5
Sodii Sulphas	58·5 59·5 60·5	1 of Na_2SO_4 2·88 2·68 2·44	1 in less than 0·5 at 77-86° F.	1 in 3	1 in 2·8
Calcii Hydras	60	1 of CaO in 780	Not given	Not given	Not given
Potassa Caustica ...	60	1 of commercial KOH (containing 87·5 per cent. KOH) in 0·772	1 in 0·5	Not given	1 in 0·5
Potassii Citras	60	1 of commercial salt [containing 94 per cent. $C_3H_4OH(COOK)_3$] in 0.61	Very soluble	Not given	1 in 0·6
Potassii Tartras ...	62	1 of $(K_2C_4H_4O_6)_2H_2O$ in 0·658	1 in 1	1 in 0·7	Not given
Potassii Tartras Acidas.....	58	1 of commercial salt [containing 97 per cent. $(CHOH)_2COOH \cdot COOK$] in 218·6	1 in 200	1 in 192	1 in 201
Soda Tartarata.....	59	1 of $(CHOH)_2COONaCOOK 4H_2O$ in 1·392	entirely soluble	1 in 1·4	1 in 1·4

In the course of this investigation the following points suggested themselves as worthy of consideration in the compilation of the next Pharmacopœia.

1. *Quantity of Salt to be Used in Testing.*—That wherever possible the qualitative tests should be applied to 10 c.c. of solution containing 0·5 Gm. of salt.

2. *Method of Expressing the Results of Assays.*—That wherever possible the results should be expressed in percentages of pure salt in the salt tested.

3. *Sodii Bromidum.*—That the salt be required to be "completely" soluble in water.

4. *Potassii et Sodii Bromidum.*—That the thiocyanate test should be revised.

5. *Ammonii Carbonas.*—That one Gm. of the salt neutralise 18 (instead of 18·7) cubic centimetres of volumetric sulphuric acid; that a test for thiocyanate be introduced.

6. *Sodii Bicarbonas.*—That a test to exclude a salt containing over 2 per cent. of monocarbonate be introduced.

7. *Potassii Carbonas.*—That the wording of the assay process be altered.

8. *Lithii Carbonas.*—That the assay process be changed.

9. *Sodii Phosphas.*—That an assay process be introduced.

10. *Potassii Permanganas.*—That oxalic acid be introduced into the Appendix; it is required for testing this salt.

11. *Sodii Arsenas.*—That a better process of assay is desirable if a convenient one can be devised.

12. *Sodii Hypophosphis.*—That Jowett's process of assay be introduced to replace the permanganate process.

13. *Sodii Nitris.*—That the assay by permanganate of potassium is to be preferred to the gasometric method.

14. *Plumbi Acetas.*—That the assay by sulphuric acid be replaced by that with oxalic acid.

15. *Potassii Acetas.*—That it is desirable to limit the amount of moisture permitted.

16. *Potassii Bichromas.*—That iron wire dissolved in dilute sulphuric acid be used in the assay.

17. *Sodii Benzoas.*—That the requirements of the Pharmacopœia are possibly rather too high.

18.—*Potassii Citras.*—That the formula be altered to

$$C_3H_4-OH-(COOK)_3,H_2O$$

19. *Potassii Tartras.*—That the formula be altered to

$(K_2C_4H_4O_6)_2H_2O$, and that the salt should be required to be free from carbonates.

Species Infantium. (*Pharm. Centr.*, xlii. 40.) Chamomiles, 10; fennel fruits, 10; marsh mallow root, 20; licorice root, 20; couch grass root, 20; parsley fruit, 5.

Spirit of Nitrous Ether, Deterioration of. David Gilmour. (*Pharm. Journ.* [4], xii. 54). The experiments conducted on spirit of nitrous ether stored under various conditions of size of storage vessels, light, and frequency of opening, emphasise the importance of strictly following the official directions to "preserve the spirit" in well closed vessels, preferably in a cool dark place. It was found that 1 lb. bottles stored in a cool underground cellar afford the best means of preservation. Even when stored in Winchester quarts *unopened* in such a place the deterioration is slow, but proceeds more rapidly as soon as bulk is broken. Comparison of similar bottles kept in the cellar and in the light of the pharmacy demonstrate that the latter lose strength much more rapidly.

Squill, Vinegar of. George F. Merson. (*Pharm. Journ.* [4], xii. 208) advocates the preparation of an acetic fluid extract 1 : 1, by the repercolation of roughly bruised squill with 33 per cent. acetic acid, or, as this preparation is somewhat viscous, a 1 : 2 acetic percolate might be substituted, the menstruum being a mixture of equal volumes of the official acid with water. From the stronger of these preparations (1 : 1) syrup of squill may be prepared by dissolving, in the usual way, sugar 38 oz. in water, 17½ oz., and allowing to cool just short of crystallizing, then adding 2½ fl. oz. of the acetic extract, finally adjusting the weight of the syrup to 3 lbs. 10 ozs. If the weaker acetic extract, 1 : 2, be employed, a correspondingly less quantity of water should be taken to dissolve the sugar, and 5 fl. oz. of the extract added to the syrup. An alternative method consisting in merely adding 5 fl. ozs. of the weaker (1 : 2) fluid extract to 15 fl. oz. of simple syrup, would probably be found to give a satisfactory product. The same preparations, suitably diluted, might be employed for the preparation of oxymel and vinegar of squill.

Squill, Oxymel of, Simplification of Formula. J. F. Brown. *Pharm. Journ.* [4], xii. 81.) The official directions might be modified by prescribing 4 parts by weight of honey to be dissolved in 1 part by measure of the acetum, with the necessary correction of more of either ingredient to adjust the final sp. gr. to 1·320.

Sugar-Coating Pills. C. S. N. Hallberg (*Amer. Drugg.*, xxxvii. 353) recommends the following as a quick method for sugar-coating pills: While gelatin-coated pills leave little to be desired and may be so easily extemporized by the pharmacist through the use of gelatin capsules, yet there is no disguising the fact that there are many persons who cannot swallow a gelatin-coated pill or capsule without "gagging." Again there is the serious objection that, under certain conditions, with alkaline instead of acid reaction in the stomach, lack of water, etc., the gelatin coating may not dissolve, as amply illustrated in fever epidemics during the late Spanish-United States war, and from the experience of nearly every physician when prescribing quinine sulphate in gelatin-pill form. Of course, a pill is intended for action in the intestines and not in the stomach, and here the alkalinity of the bile secretions will certainly not favour the solution of the gelatin, and some other coating is therefore desirable. The author has, for a number of years past, used milk sugar, and has formulated the following method.

A mixture is prepared of the following powders: acacia pulv., 2; sacch. lacti, 8.

The pills are thoroughly coated with acacia mucilage by quickly rolling the dust-free pills with the fingers on a piece of filter-paper saturated with mucilage laid on a pill tile; the moment the pills are covered they are transferred to a small casserole (capsule with a handle), the bottom of which is covered with a layer of the above powder and quickly rotated, separated with the fingers if necessary, until completely covered with a firm coating. If a heavy coat be not secured, repeat the operation with the mucilage. Transfer the pills to a clean casserole, beaker, or box, and rotate or oscillate for several minutes, when the pills will be rounded by attrition, and a fairly firm, elegant cream-white coating will be attained. The best results are obtained by using from 10 to 50 pills for each operation.

Suppositories, Accuracy in the making of. W. B. Cowie. (*Pharm. Journ.* [4], xii. 60.) The author confirms the fact to which attention was first drawn by White and Braithwaite (*Pharm. Journ.* [4], v. 437), that, as a rule, the dosage of the active ingredient in suppositories is far from accurate, and the weight of the suppositories themselves shows a wide range. In a trial prescription for dried sodium carbonate, 10 grains, oil of theobroma, q.s., for 60 grains, made with care, the range of total weight was found to vary between 60 and 61 grains,

and the amount of sodium carbonate from 10 to 10¾ grains. For the same prescription dispensed in 21 different pharmacies, suppositories were supplied which varied in weight from 56 to 79 grains, and in sodium carbonate from 5½ grains to 8¾ grains. To obviate the error arising from the varying capacity of the moulds and specific gravity of bases, it is suggested to prepare more of the mass than is requisite for number of suppositories required, and to weigh off each portion accurately into each mould.

Suppositories of Rhatany Extract. Dalainzy (*Bull. Comm.*, xxix. 131) obtains a perfectly homogeneous mixture of cacao butter and extract of rhatany by the following simple method. The extract is dissolved in the smallest possible quantity of water with a gentle heat; the cacao butter is melted and turned, with the dissolved extract, into a mortar and mixed. As soon as it begins to set the mass is beaten as in making an ointment. In this way a perfectly homogeneous mass will be obtained, which merely requires remelting at the lowest possible temperature and then moulding. In summer 1 per cent. of wax should be added to the mass.

Suppositories of Whortleberry Extract. H. Strauss. (*Merck's Report*, 1900, viii. 97.) The extract of *Vaccinium myrtillus* has been found to be a useful astringent and antiseptic for various affections of the lower intestine. It is best administered in the form of suppositories as follows: Extract of whortleberry, 1 oz.; potassium carbonate, 45 grains; distilled water, 2 fl. drs.; cacao butter, 2 oz. Mix and divide into 30 suppositories. Two to be used daily.

Syrupus Ferri Phosphatis c̄ Quinina et Strychnina. W. Lyon. (*Pharm. Journ.* [4], xii. 29.) In order to ensure keeping without deposit during the summer it is suggested that the amount of phosphoric acid should be increased to 7·25 or 8·25 per cent. The directions to "heat gently" should be modified, since a temperature above "summer-heat" (22° – 27° C.) is to be avoided. The directions for dissolving the alkaloids, also require revision: they should be first rubbed down in a mortar with 30 c.c. of water and then added to the solution of ferrous phosphate.

Syrupus Hypophosphitum Compositus. W. Lyon. (*Pharm. Journ.* [4], xii. 29.) Citric acid, in the proportion of 10 grains to the pint of syrup, is recommended as a preservative. The amount of hypophosphorous acid in the B.P.C. formula should at the same time be reduced from 120 minims to 30 minims.

Syrupus Heroinæ. (*Pharm. Centr.*, xlii. 39.) Heroin, 1; dilute acetic acid, Ph. G. (30 per cent.), 9; simple syrup, 990.

Throat Pastilles. The following three formulas for throat pastilles have been recommended in the *Laryngologist* (through *Western Drugg.*, xxiii. 67).

Compound Boric Acid Voice Pastilles. Slightly stimulant and antiseptic. Each pastille contains benzoic acid, gr. ½; boric acid, gr. 1; coca, gr. 1½; black currant paste q.s. One pastille dissolved on the back of the tongue twenty minutes before using the voice, is useful for clearing the tone when hoarse or husky.

Compound Aconite Pastilles for Pharyngitis. Anodyne and anæsthetic. Each pastille contains: Morphine bimeconate, gr. 1/100; cocaine hydrochlorate, gr. 1/125; tincture of aconite, ♏ 1/6; black currant paste, q.s. Used for both local and constitutional effects in acute pharyngitis, rhinitis, laryngitis.

Compound Guaiacum Pastilles for Tonsilitis. Powerful local alternative. Each pastille contains: Resin of guaiacum, gr. 2; morphine bimeconate, gr. 1/100; tincture aconite, ♏ 2; oil cinnamon, ♏ 1/16; powdered cinnamon, gr. 1; black currant paste q.s. The cinnamon absolutely disguises the taste of the guaiacum, and at the same time adds to the efficiency of the pastille. Guaiacum in the combination is very pleasant, very potent and very prompt in reducing the inflammatory engorgement in tonsillitis, acute pharyngitis, and in the removal of arthritic throat affections. The peculiar acid of black currants seems to enhance the efficiency of all these forms of pastilles, and the currant jelly or paste renders the above formula permanently plastic, soluble and pleasant.

Thiosinamine Soap. P. C. Unna (*Monats. für Prackt. Derm.*, through *Merck's Report*, viii. 1900, 181) recommends the use of a mixture of thiosinamine with a soapy basis, or as a plaster mull in place of injections. The soap is prepared by mixing from 7½ to 30 grains of thiosinamine with superfatted soft soap, 150 grains.

Thyme Syrup, Thyme Juice. (*Pharm. Centr.*, xlii. 39.) Fluid extract of thyme, 1; simple syrup, 6. (The fluid extract of thyme is prepared in the usual manner for valoid fluid extracts, the menstruum for the first portion of the percolation, until the reserve percolate has been obtained, being alcohol 90 per cent. 10; water, 4; glycerine 1. After this, percolation is continued to exhaustion with a menstruum of alcohol 90 per cent. 1, and water 3.) The syrup is much used on the Continent as a remedy for pertussis.

Tinctures, Standard Official, Specific gravity, Alcoholic strength and percentage of dissolved Extractive in. F. W. Fletcher. (*Chem. and Drugg.*, lvii. 14.)

Standard Tincture, B.P., 1893	I. Sp. gr. of Spirit used	II. Sp. gr. of Tincture	III. Percentage of Alcohol in Menstruum by volume	IV. Percentage of Proof Spirit in Menstruum by volume	V. Percentage of Proof Spirit in Tincture by volume	VI. Percentage of solid residue dried at 100° C.
Tinct. Aconiti	0·890	0·894	70	122·5	116·0	0·94
,, Aloes	0·944	0·974	45	79·0	66·8	5·39
,, Arnicæ	0·890	0·895	70	122·5	104·4	0·90
,, Asafetidæ	0·890	0·916	70	122·5	100·8	11·02
,, Belladonnæ	0·913	0·916	60	104·9	104·0	0·36
,, Benzoin. Co.	0·834	0·892	90	157·7	118·5	15·85
,, Buchu	0·913	0·929	60	104·9	100·0	2·90
,, Calumbæ	0·913	0·919	60	104·9	99·2	0·85
,, Camph. Co.	0·913	0·916	60	104·9	87·2	0·50
,, Cannabis Indicæ	0·834	0·846	90	157·7	140·8	4·50
,, Cantharidis	0·834	0·841	90	157·7	150·5	0·16
,, Capsici	0·890	0·896	70	122·5	113·1	0·92
,, Card. Co.	0·913	0·948	60	104·9	90·5	7·77
,, Cascarillæ	0·890	0·897	70	122·5	113·1	1·90
,, Catechu	0·913	0·963	60	104·9	84·8	11·90
,, Chiratæ	0·913	0·922	60	104·9	95·8	1·10
,, Cimicifugæ	0·913	0·924	60	104·9	97·1	2·60
,, Cinchonæ	0·890	0·905	70	122·5	115·9	3·90
,, Cinchonæ Co.	0·890	0·906	70	122·5	110·4	4·20
,, Cinnamomi	0·890	0·901	70	122·5	110·4	2·20
,, Cocci	0·944	0·957	45	79·0	72·5	2·00
,, Colchici Sem.	0·944	0·981	45	79·0	72·5	7·70
,, Conii	0·890	0·895	70	122·5	113·1	3·00
,, Croci	0·913	0·926	60	104·9	88·3	2·60
,, Cubebæ	0·834	0·846	90	157·7	135·2	1·50
,, Digitalis	0·913	0·930	60	104·9	96·7	2·90
,, Ergot. Ammon.	0·913	0·934	60	104·9	84·7	3·20
,, Gelsemii	0·913	0·921	60	104·9	99·2	1·50
,, Gent. Co.	0·944	0·968	45	79·0	71·6	5·70
,, Guaiaci Ammon.	0·834	0·896	90	157·7	110·3	16·40
,, Hamamelidis	0·944	0·953	45	79·0	74·4	2·20
,, Hydrastis	0·913	0·923	60	104·9	97·5	2·30
,, Hyoscyami	0·944	0·954	45	79·0	75·4	2·10
,, Iodi	0·834	0·885	90	157·7	151·8	—
,, Jaborandi	0·944	0·960	45	79·0	71·6	2·50
,, Jalapæ	0·890	0·907	70	122·5	113·1	1·80
,, Krameriæ	0·913	0·933	60	104·9	92·6	8·20
,, Lavand. Co.	0·834	0·839	90	157·7	134·9	0·56
,, Lupuli	0·913	0·933	60	104·9	91·6	4·10
,, Myrrhæ	0·834	0·852	90	157·7	134·9	4·30
,, Nucis Vom.	0·834	0·853	90	157·7	111·4	2·40
,, Opii	0·944	0·950	45	79·0	81·7	3·30
,, Podophylli	0·834	0·850	90	157·7	121·3	3·60
,, Pruni Virg.	0·918	0·939	58	101·5	89·2	2·90
,, Pyrethri	0·890	0·911	70	122·5	110·3	4·90
,, Quassiæ	0·944	0·950	45	79·0	71·0	0·31
,, Quillaiæ	0·913	0·920	60	104·9	91·6	1·20
,, Rhei Co.	0·913	0·964	60	104·9	87·2	17·00
,, Scillæ	0·913	0·956	60	104·9	93·8	9·10
,, Senegæ	0·913	0·935	60	104·9	91·6	5·70
,, Sennæ Co.	0·944	0·994	45	79·0	65·5	12·20
,, Serpentariæ	0·890	0·898	70	122·5	113·1	1·70
,, Stramonii	0·944	0·962	45	79·0	71·3	3·70
,, Strophanthi	0·890	0·893	70	122·5	113·1	0·90
,, Sumbul	0·890	0·904	70	122·5	107·4	2·20
,, Tolutana	0·834	0·868	90	157·7	131·1	9·20
,, Valerian. Ammon.	0·913	0·937	60	104·9	79·9	2·50
,, Zingiberis	0·834	0·851	90	157·7	135·0	0·55

Unguentum Hydrargyri Nitratis. W. Lyon. (*Pharm. Journ.* [4], xii. 29.) The less elaborate method of manipulation prescribed in the B.P., 1885, is considered to give results as good as the more complicated process of the B.P., 1898. The heating of the oil and lard to such a temperature that it will reach 290° F.(143·3° C.) when transferred to the mixing vessel is considered to be unnecessary.

Vasoliments. Under this name (*Pharm. Centr.*, xli. 756) a combined soap hydrocarbon basis for medical inunction has been introduced. *Simple vasoliment* is prepared by saponifying oleic acid 50. with alcoholic ammonia 25; the soap being heated with liquid paraffin 100, until solution is effected. The weight is then made up to 175 with alcohol. *Thick vasoliment* is prepared in a similar manner, but the alcohol is evaporated off. Medicated vasoliments are prepared as solutions of the active ingredients in simple vasoliment in the following percentage proportions respectively. *Salicylic acid*, 2 per cent.; *camphorated chloroform*, camphor 30 per cent., and chloroform 30 per cent.; *iodine*, 6 per cent.; *ichthyol*, 10 per cent.; *creolin*, 5 per cent.; *menthol*, 2 per cent.: *Venice turpentine*, 20 per cent.; *iodoform*, 1·5 per cent.: *deodorized iodoform*, iodoform 1·5 per cent., eucalyptol 1·5 per cent.; *eucalyptol*, 20 per cent.; *naphthol*, 10 per cent.; *guaiacol*, 20 per cent.: *thiol*, 5 per cent. An alternative form of *iodoform vasoliment* is prepared by Whippern. (*Pharm. Centr.*, xlii. 1) by heating together in a flask until dissolved. Linseed oil, 27; iodoform, 3; simple vasoliment, 70. *Empyreumatic vasoliment* is prepared from juniper tar, 25; and simple vasoliment, 75. *Mercurial vasoliment*, from mercury, 40; anhydrous wool-fat, 20; and thick vasoliment, 60. *Tar vasoliment* is composed of tar, 25; dissolved in alcoholic ammonia, 25; simple vasoliment, 75; mixed, evaporated on the water bath to 100, and filtered. The same author (*Pharm. Centr.*, xlii. 17) prepares *sulphur vasoliment* by heating together, until dissolved, sulphur 3 and linseed oil 37. The whole is then made up with simple vasoliment to 100. *Compound sulphur vasoliment* is made by mixing sulphur vasoliment, 100; cade oil, 100; thymol, 3; eucalyptol, 30; turpentine, 300; and making up with vasoliment to 1,000.

Viscin. (*Merck's Report*, viii. 1900, 184.) Birdlime, which is stated to be derived from the berries and bark of *Viscum album*, has been brought into commerce in the form of a solution in benzine, as an adhesive basis for plasters and other skin medications. The ordinary viscin basis for a plaster is thus composed: viscin

solution, 1,500; powdered orris root, 100; starch, 400; Venice turpentine, 280; and gum dammar, 30. The mixture is reduced to a paste by evaporation. Various active ingredients, as prescribed, are incorporated before evaporation. Under the name of *Zincum viscosum*, a viscin solution of the consistence of linseed oil, containing 10 per cent. of zinc oxide, is prepared. Viscin may be incorporated with tar or any other medicament.

Warburg's Tincture. F. A. Sieker (*Amer. Journ. Pharm.*, lxxii. 571) proposes the following formula for the preparation of Warburg's tincture. All the crude drugs should be freshly crushed. Socotrine aloes, 263; angelica seeds, rhubarb, of each 85; Elecampane, saffron, fennel fruits, of each 42·5; prepared chalk, gentian, zedoary, cubebs, myrrh, camphor agaric, of each 21·25. Macerate for seven to fourteen days at ordinary temperatures, with 9,000 fl. pts. of a mixture of alcohol (94 per cent.) 6,000 fl. pts., and water 4,000 fl. pts. Decant, press and filter. Break up the marc, wash it with the rest of the menstruum, again press and filter. To the filtered liquid add quinine sulphate 200, and measure. To the quantity of water required to produce sufficient of the above menstruum to make the final volume 10,000, add sulphuric acid 22, and finally the requisite amount of alcohol to complete the bulk.

Worm Syrup. (*Amer. Drugg.*, xxxvii. 218.) Santonin, 5 grs.; fluid extract of senna, 1 oz.; glycerin, ½ oz.; syrup of anise, 8½ ozs. Rub the santonin to powder and mix with the glycerin; add the other ingredients and mix.

Doses: Under one year, ½ drachm; between one and two years, 1 drachm; between two and four years, 1½ drachms; between four and six, 2 drachms; and for older children, 3 drachms. To be taken the first thing in the morning, fasting, after the bottle has been shaken.

Yerba Santa, Aromatic Syrup of. (*Amer. Drugg.*, xxxvii. 307.) Yerba santa leaves, 8 troy ozs.; cinnamon bark, cloves, of each ½ oz.; cardamom seed, 2 drs.; sweet orange peel (fresh), 1 oz.; coriander seed, caraway seed, anise seed, cochineal (powd.), potassium bicarbonate, of each 1 dr.; glycerin, 8 fl. ozs.; sugar, 36 troy ozs.; water, sufficient to make 64 fl. ozs.

Mix the drugs and reduce to a coarse powder. Mix the glycerin with 8 fl. ozs. of water, and with this moisten the drugs, macerating for twenty-four hours. Add the potassium bicarbonate, previously dissolved in 8 fl. ozs. of water, and pack lightly in a percolator. Percolate with water until two pints are obtained; in this dissolve the sugar with a gentle heat and strain, adding

sufficient water through the percolator to make up the volume to 64 fl. oz.

One fluid ounce of this syrup represents 60 grains of yerba santa, with aromatics, and completely masks the bitterness of 8 grains of quinine sulphate.

NOTES AND FORMULÆ.

PART IV.

NOTES AND FORMULÆ.

Artificial Bitter Waters. (*Chem. and Drugg.*, lviii. 445.) (1) Potassium sulphate 6 gr., calcium sulphate 60 gr., sodium sulphate ℥iijss., magnesium sulphate ℥ivss., water Cj. (2) Potassium sulphate 30 grs., sodium chloride ℥iss., sodium bicarb. ℥vi., sodium sulphate ℥xvi., calcium sulphate ℥iss., magnesium sulphate ℥iij., iron sulphate gr. xv., water Cx.

Borax and Formaldehyde as Food Preservatives. W. B. Halliburton finds (*Brit. Med. Journ.*, 2062, 1) that borax, even in the proportion of 1 : 1000, completely inhibits the action of the rennet ferment on milk, and that a smaller proportion delays its activity. Boric action alone has but little inhibiting action over the unorganised rennet ferment, but its antiseptic action is but slight. The author does not agree with A. H. Allen that formaldehyde is the least objectionable of food preservatives, since its activity in counteracting fermentative changes renders it particularly objectionable. A proportion of 0·5 per cent. renders gastric digestion almost impossible, and any quantity over 0·05 per cent. considerably retards it. It is even more active in preventing pancreatic digestion of proteids and of starch. The addition of formaldehyde to milk in the proportion usually employed in the milk trade has a marked retarding influence on the action of the rennet ferment. The author concludes from experiment conducted *in vitro*, that both these preservatives are objectionable, as tending, in a very marked degree, to lessen the digestibility of foods to which they have been added.

Borsalyl. (*Pharm. Zeit.*, xlvi. 305.) Sodium salicylate 320 is dissolved in distilled water 1,000, and heated on the water-bath with thorough stirring, after adding boric acid 250.

Cachous, Aromatic. (*Chem. and Drugg.*, lviii. 6.) Oil of cinnamon 6 ♏; oil of peppermint 32 ♏; oil of neroli 12 ♏; cloves,

freshly powdered, 40 gr.; cardamoms, freshly powdered, 80 gr.; vanilla, freshly powdered, 120 gr.; orris-root, freshly powdered, 150 gr.; mace, freshly powdered, 400 gr.; chocolate, freshly powdered, 3½ ozs.; sugar 300 gr.; extract of licorice, a sufficient quantity. Mix, and divide into cachous.

Carbolic Tooth Powders. (*Pharm. Zeit.*) (1) Carbolic acid 8 Gm.; powdered orris-root 15 Gm.; powdered cuttle fish 15 Gm.; kieselguhr 210 Gm.; oil of wintergreen 10 drops; oil of peppermint 10 drops; carmine 0·2 Gm. The carmine is rubbed down with the phenol and orris, a little of the kieselguhr being added. The rest of the ingredients are then mixed in, and the whole sifted. (2) Precipitated chalk 100 Gm.; phenol 10 drops; otto 4 drops; sodium carbonate 20 Cgm.; carmine 30 Cgm.; water q.s.

Catheter Lubricant, Gouley's. (*New York Medical Journal.*) White castile soap powder, 1 oz.; water 3 ozs.; mucilage of chondrus crispus 3 ozs.; formalin (40 per cent.) 10 ♏; thymol 5 grs.; oil of thyme 5 ♏; alcohol 15 ♏.

Heat the soap and water, and stir until a homogeneous slime is formed; then add the three ounces of mucilage (made of the strength of one ounce of chondrus crispus to the pint of water). When cool, pour in the formalin, then the thymol and oil of thyme mixed with the alcohol; stir, strain, and keep in a covered vessel until all air bubbles have vanished. The result is an opalescent, slimy substance, of the consistence of honey, which should be put up at once in two-ounce collapsible tubes and sterilized.

Cement, Aquarium. (*Nat. Drugg.*, xxx. 93.) Litharge, fine white sand, and plaster of Paris, of each 3 parts; resin, finely powdered, 1. Mix thoroughly, then work up the mixture with boiled linseed oil (to which a dryer has been added) to the consistence of cream, stirring it actively until a completely homogeneous mixture is obtained. Do this five or six hours before using the cement, set aside, and give it an occasional stir in the meantime.

Cement—"Chinese Grip." (*Nat. Drugg.*, xxx. 86.) Best white glue 16 parts; white lead 4; alcohol 8; water, soft or distilled, 32.

Melt the glue in the water, over a water-bath, and when completely dissolved, add and stir in the white lead. Remove from the fire, let cool down somewhat, and then add the alcohol in a slow stream under constant stirring. Preserve in tightly-stoppered jars.

Cement for Gas Burners. (*Meyer Brothers' Druggist*, xxi. 331.) Litharge, glycerin, of each sufficient to make stiff paste.

Cement for Attaching Glass Labels to Bottles. (*Meyer Brothers' Druggist*, xxi. 331.) Resin 1 part; yellow wax 2. Melt together.

Cement for Rubber. (*Meyer Brothers' Druggist*, xxi. 331.) Gutta-percha, in pieces, 2 av. ozs.; carbon bisulphide, 4 fl. ozs.; oil of turpentine, 1 fl. oz.; asphalt, in powder, 2 av. ozs. Dissolve the gutta-percha in the carbon bisulphide and oil of turpentine, add the asphalt, let stand for several days, occasionally shaking; if not a perfect solution, strain or decant off the clear portion. This is useful in mending leather, cementing to wood, etc.

Before applying it to leather, the leather should be freed from grease or oil by treatment with benzin. Gutta-percha, in pieces, 1 av. oz.; carbon bisulphide, 8 fl. ozs.; resin, 40 grs. Mix and dissolve. Gutta-percha, 15 grs.; chloroform, 2 fl. ozs.; gum mastic, ½ av. oz. Dissolve the gutta-percha first in chloroform, then add the mastic, in powder, and let stand for a week or so before using. This cement is useful for repairing articles of vertu, etc.

Chilblain Remedies. (*Amer. Drugg.*, xxxvii. 277.) *For unbroken chilblains.*—White and yolk of one egg; diluted acetic acid, 8 ozs.; spirit of camphor, 1 oz.; oil of turpentine, ½ oz.; tincture of arnica, 1 dr. Directions: soak the affected parts in hot water and dry them; shake the lotion well, and rub it in and allow it to dry before the fire.

Camphor and chloroform ointment.—Camphor ointment, 2 dr.; petrolatum, 1 oz.; chloroform, 10 ♏.

Swediaur's paste.—Bitter almonds, 8 ozs.; honey, 6 ozs.; powdered camphor, ½ oz.; mustard, ½ oz.; burnt alum, ¼ oz.; olibanum, ¼ oz.; yolks of 3 eggs. Beat together to form a paste. Rub a portion on the part affected, moistened with water, night and morning, then wash with warm water and dry with a cloth.

Camphor and arnica lotion.—Tincture of arnica, rose water, glycerin, of each 3 parts; spirit of camphor, 1.

Sulphur lotion.—Sulphurous acid, glycerin, of each 1 part; distilled water, 2.

Iodine collodion.—Tincture of iodine, 2 parts; ether, 15; collodion, 50.

For broken chilblains.—Yellow wax, 15 parts; rape oil, 50; yolk of egg, 1; lead acetate, 5.

For chilblain and frosted feet.—Tincture of iodine, 2 parts; camphor 1. Apply with a feather night and morning.

Chilblain crayons.—Camphor, 3 parts; iodine, 6; olive oil, 96; paraffin, 57; alcohol, q.s. Dissolve the camphor in the oil, and the

iodine in as small a quantity of alcohol as possible. Add the mixed liquid to the melted paraffin and pour the whole in suitable moulds. The pencil can be rendered hard or soft by the addition or diminution of olive oil.

Cholesterin, an Antidote to Saponin. F. Ranson (*Chem. Centr.*, lxxii. 1112) gives the results of his experiments with saponin as a hæmolytic agent in which dog's blood was employed, as other bloods only differ quantitatively in their sensitiveness. The serum and the red corpuscles are capable of fixing saponin. In the red corpuscles the substance which combines with the glucoside is soluble in ether. As the ether extract of both of these blood constituents contains cholesterin as a chief ingredient, the property in question is attributed to this, which the author proves experimentally by showing that the addition of a little chloresterin to saponin renders it harmless to animal life.

Clove Pink Sachet Powder. (*Amer. Drugg.*, xxxviii. 115.) Oil of cloves, 5 drops; otto of rose, 10 drops; oil of neroli, 12 drops; oil of sandal, 20 drops; musk, 2 grains; pimento, 1 dr.; tonka beans, 2 dr.; patchouli leaves, ½ oz.; lavender flowers, dried, 1 oz.; orris root, in powder, 1 oz.; bran, coarsely powdered, 1 oz. The oil of cloves should be dissolved in a little alcohol, and added in sufficient quantity to give the desired odour in combination with the rose. The odours of rose and clove should predominate.

Another formula which has been recommended is the following: Bran, in coarse powder, 12 ozs.; lavender flowers, 6 ozs.; patchouli leaves, 3 ozs.; cloves, 1½ oz.; tonka beans, 1½ oz.; musk, 12 grains; oil neroli, 60 drops; otto of rose, 60 drops; oil sandal, 120 drops; oil lavender, 60 drops; solution of rosin, q.s. Mix.

Cold Cream, a New Formula for. W. C. Alpers. (*Amer. Journ. Pharm.*, lxxiii. 117.) White wax, 150 parts; paraffin, liquid, 600; water, 240; borax, 9; oil of geranium, 1; oil rose, q.s. Dissolve the wax in the oil with the aid of a gentle heat; in another vessel dissolve the borax in the water; bring both solutions to the same temperature, not exceeding 60° C. (140° F.), and pour the aqueous solution into the oil in a continuous stream. Stir gently for a minute or two, add the essential oils while stirring, and pour into jars before cold.

This preparation is a snow white, soft and smooth ointment of glossy appearance and pleasant odour. The time to prepare it is less than fifteen minutes. It will keep in the heat of summer and the cold of winter, becoming but slightly thinner in summer. From the testimony of those who have used this preparation, it is

fully equal, if not superior, to any other cold cream, rendering the skin soft and white, and exercising a soothing influence on irritated surfaces, chapped hands and lips.

Crotin. Kobert (*Merck's Report*, 1900, viii. 81) has found in croton seeds an albuminoid, crotin, which like abrin and ricin is a powerful poison when introduced into the circulation of certain animals, causing agglutination or dissolution of the red corpuscles of the blood. Crotin is stated to differ from abrin and ricin in its action on human blood and that of the dog and some other animals, since in these it is without action, whereas the other albuminoids are very active. Crotin acts as a coagulant on milk and it is not destroyed by the action of digestive ferments.

Damp Walls, Dressing For. (*L'Union Pharm.*) Freshly slaked lime 1,000 is mixed with salt 1,000 and water 4,000, the magma boiled and skimmed. To each 1,000 of the resulting limewash add alum 20, powdered ferrous sulphate 10, caustic potash 15, and fine sand 200. The mixture is then thinned down, if necessary, with water, and applied in the same manner as lime wash.

Dentifrice. Frohmann. (*Amer. Drugg.*, xxxvii. 247.) Some experts are strongly opposed to all ingredients in dentifricial preparations, whether powders, pastes, liquids, or soaps, which have a wearing or abrading action on the enamel of the teeth; also every description of insoluble matter, like chalks, pumice, etc., and especially to all those substances which have any chemical action on the teeth—all of which constitute component parts of all dentifrices in the market to-day. Frohmann, a Berlin dentist, recommends instead of these, a soap produced from the following formula: Thymol, 25 parts; extract of rhatany, 100; glycerin, hot, 600; magnesia, calcined, 50; sodium borate, 400; oil of peppermint, 100; Castile soap, sufficient to make 3,000. Dissolve the thymol and extract of rhatany in the hot glycerin, and add the other ingredients, with constant agitation.

Depilatories. Butte (formulary of *Bull. Gen. de Therap.*) employs the following dressing to the downy surface: Tincture of iodine (1 : 12), 3; oil of turpentine, 6; castor oil, 8; alcohol (90 per cent.), 19; collodion, 100. The hairs are removed with the pellicle formed by the collodion. Another modification of a similar formula known as American depilatory consists of iodine, 32; oil of turpentine, 6; castor oil, 8; absolute alcohol, 40; collodion, 120.

Digestion in the pitchers of Nepenthes. In a communication to the Belgian Royal Academy (*Journ. Pharm. Chim.* [6], xiii. 251) G. Clautrian describes a series of experiments made, both with

plants growing in the natural state in Java and with those under cultivation, which fully confirm the statements of previous observers as to the digestive powers of the liquid in the pitchers of *Nepenthes*. The substance employed in the test was a sterilized 10 per cent. solution of egg albumin containing 1 in 1,000,000 of ferrous sulphate, which rendered it non-coagulating, and therefore capable of sterilisation by boiling. In two days the albumin introduced into closed pitchers had completely disappeared and no syntonin albumoses or peptones were found. If the pitcher were cut off from the plant no digestion took place. The absorption of the digested albuminoids takes place by the same glands which secrete the acid and the ferment: if the liquid in the pitchers be coloured with methylene blue, the dye penetrates through these glands to the subjacent parenchyma, in the neighbourhood of the tracheides, which are found at the base of the glands. The liquid found in the unopened pitchers is neutral, but becomes acid as soon as they open, or if they are excited by agitation by the wind, or by a blow, or even by the presence of larvæ in the walls.

Eau de Cologne. (*Amer. Drugg.*, xxxviii. 194, after *Profumiere Italiano.*) I.—Oil of bergamot, 1 Gm.; oil of lemon, 2·5; oil of neroli, 1·5; oil of rosemary, 1; alcohol, 96 per cent., 300; orange flower water, 75.

II.—Oil of bergamot, 8 Gm.; oil of lemon, 4 Gm.; oil of neroli, 1 Gm.; oil of origanum, 6 drops; oil of rosemary, 1 Gm.; alcohol, 96 per cent., 600 Gm.; orange flower water, 50 Gm. Cologne water improves with age, acquiring on keeping a characteristically delicate odour. This is supposed to be the result of a special etherification of the alcohol with the oils and resulting intermolecular changes. The manufacturers of Cologne water accelerate this change either by exposing the water in glass stoppered bottles to the action of the sun's rays, or by warming it gently in a water bath for a period of forty-eight hours.

III.—Oil of neroli, 1 Gm.; oil of lemon, 4; oil of bergamot, 5; oil of cedar, 1·5; oil of lavender, 2; oil of rosemary, 2; melissa water (Ph.G.), 160; alcohol, 1,000.

IV.—("*Jülichsplatz, No.* 4.")—Oil of orange, 2·5 Gm.; oil of lemon, 3·5; oil of bergamot, 1·5; oil of neroli, 1·5; oil of rosemary, 1·5; alcohol, 370.

V.—("*Gegenüber dem Jülichsplatz.*")—Oil of lemon, 350 Gm.; oil of bergamot, 270; oil of lavender, 20; oil of peppermint, 12; oil of neroli, 6; oil of white thyme, 5; oil of rosemary, 5; oil of rose, 1; acetic ether, 12; orange flower water, 1,110; rose water,

200. Allow to macerate for one to two months, and then dilute with six to eight kilos. of alcohol and distil.

VI.—Oil of bergamot, 12 Gm.; oil of neroli, 6; oil of lemon, 6; oil of mace, 1; oil of rosemary, 1; alcohol, 960.

VII.—Oil of orange, 24 gm.; oil of lemon, 24; oil of bergamot, 1·5; oil of neroli, 0·5; oil of petitgrain, 0·5; oil of rosemary, 0·5; alcohol, 770.

Eggs, to Preserve. F. T. Strutt. (*Chem. News*, lxxxiii. 268.) Saturated lime water is prepared by the addition of one pound of lime, previously slaked, to five gallons of water. The eggs are packed in a barrel or other suitable vessel, and covered with the lime water, the surface of which is then protected from atmospheric CO_2 by a layer of sweet oil, or by a sack over which a coat of lime paste has been spread. If, after a time, the lime water is noticed to precipitate, it should be siphoned off and fresh added. Care should be taken in the selection of the eggs, which should be completely immersed. The addition of salt to the pickle is not advised since it is found to impart a limy flavour to the eggs. Sodium silicate has been tried, but the results with lime water are superior, and the latter is both cheaper and more convenient to use.

Face Powders. (*Amer. Drugg.*, xxxviii. 223.) I.—Zinc oxide, 8 ozs.; orris root, powdered, 2½ ozs.; purified talcum, 10 ozs.; extract of musk, 12 drops; extract of jasmin, 9 drops; extract of white rose, 9 drops; extract of cassia, 9 drops. Mix thoroughly and pass through a fine sieve.

II.—Zinc oxide, 4 ozs.; rice powder, 14; precipitated chalk, 4; purified talcum, 2; orris root, powdered, 2. Perfume as desired. Mix well and pass through a fine sieve.

III.—Zinc oxide, 1 lb.; precipitated chalk, 6 lb.; purified talcum, 1 lb.; corn starch, 2 lb.; extract of white rose, 1 oz.; extract of jasmin, 1 oz.; extract of orange flower, 1 oz.; extract of cassia, 1 oz.; extract of musk, ¼ oz. If this powder be too light, a portion of the precipitated chalk may be replaced with prepared chalk.

IV.—Magnesium carbonate, ½ lb.; purified talcum, 1 lb.; oil of rose, 8 drops; oil of neroli, 20 drops; extract of jasmin, ½ oz.; extract of musk, 1 dr.

V.—Corn starch, 7 lb.; rice starch, 1 lb.; purified talcum, 1 lb.; powdered orris, 1 lb.; extract of cassia, 3 ozs.; extract of jasmin, 1 oz. Mix thoroughly and pass through a 100 mesh bolting cloth.

VI.—Zinc oxide, 4; rice starch, 14; precipitated chalk, 4; urified talcum, 2; orris root, powder, 2; perfume, sufficient.

VII.—Zinc oxide, 2 ozs.; orris root powder, 2 ozs.; rice starch,

16 ozs.; oil of rose, 9 drops; oil of geranium, 3 drops; oil of ylang ylang, 1 drop; coumarin, ½ gr.; acetic ether, 10 drops. Mix the first three ingredients. Mix the other ingredients so as to dissolve the coumarin, and incorporate this mixture with the powder.

VIII.—Rice starch, 5; white bole, 5; purified talcum, 2; apple blossom perfume q.s. Carmine solution to produce a pale pink.

Fertilizer for Chrysanthemums. (*Nat. Drugg.*, xxxi. 54.) Potassium nitrate, 45 parts; ammonium phosphate, 25; ammonium nitrate, 30. Mix. To use dissolve from 15 to 30 grains in a quart of water, and with this solution water the plants every ten or twelve days, watering the plants in the meantime with plain or natural water.

Wagner, a German chrysanthemum enthusiast, suggests the following formula, for which he claims great efficacy: Ammonium phosphate, 30 parts; potassium nitrate, 45; ammonium sulphate, 10; sodium nitrate, 15. Mix and use as described above. It is stated that the addition of 15 grains of iron sulphate to every quart of the solution greatly improves its action.

Fly-Papers, Sticky. (*Pharm. Zeit.*, xlvi. 122.) I.—Resin, 280; castor oil, 150; honey, 60; quassia extract, 20.

II.—Resin, 500; Burgundy pitch, 200; castor oil, 100; rape oil, 400; olive oil, 50; honey, 100; quassia extract, 50.

III.—Resin, 100 Gm.; rape oil, 60 Gm.; linseed oil, 20 Gm.; quassia extract, 5 Gm.; fennel oil, 12 drops.

Fly Syrup. (*Pharm. Zeit.*, xlvi. 122.) Simple syrup, 100 Gm.; honey, 30 Gm.; aniseed oil, 15 drops; quassia extract, 4 Gm.

Formol-Geranium for Dental Caries. (*Merck's Report*, viii. 1900, 102.) Andree and Marion employ the following antiseptic application for dental caries: Formalin 2; oil of geranium and alcohol, of each, 1. This is introduced into the cavity and root canals by means of a cotton fillet.

Fumigating Pastilles. (*Nat. Drugg.*, xxx. 385). Cinnamon powdered, 16 parts; cascarilla bark, powdered, 16 parts; benzoin, powdered, 16 parts; storax, calamite, 32 parts; styrax, liquid, 6 parts; potassium nitrate, powdered, 4 parts; charcoal, powdered, 128 parts; mucilage of tragacanth, sufficient. Make into a mass, then add the following mixture: oil of clove, 2 parts; oil of cinnamon, 2 parts; oil of lavender, 2 parts; oil of lemon, 2 parts. Mix. Work well together, then divide into pastilles of a suitable size.

Furfural in Alcoholic Beverages. T. Lauder Brunton and F. W. Tunnicliffe. (*Lancet*, 4032, 1643.) The aggravated toxic symptoms following the consumption of raw spirits and

fermented malt liquors, which are greatly in excess of those produced by the equivalent quantity of pure ethylic alcohol, are attributed to the presence of furfural in those beverages. The toxic action of furfural is very marked; in man, a dose of 10 Cgm. gave rise to an acute neuralgia-like pain at the back of the neck followed by a persistent dull headache; animals intoxicated with aldehyde-free ethyl alcohol showed no secondary symptoms; but with alcohol containing furfural these were very marked. The presence of furfural in all raw spirits as well as in beer, to a less extent, is demonstrated. Ammonia, which is usually an important ingredient in "pick me up" doses, is a valuable antidote to furfural poisoning.

Ginger Ale, Soluble Extracts of. John A. Foote. (*Amer. Drugg. and Phar. Rec.*)

Soluble Extract of Ginger for Soda Fountain Use. (To be used in the proportion of 1 oz. to 32 fl. ozs. of syrup.) Jamaica ginger, in fine powder, 8 lbs.; capsicum, in fine powder, 6 ozs.; alcohol, a sufficient quantity. Mix the powders intimately, moisten them with a sufficient quantity of alcohol, and set aside for four hours. Pack in a cylindrical percolator and percolate with alcohol until 8 pints of percolate have resulted. Place the percolate in a bottle of the capacity of 1 gallon, 4 pints, 10 fl. ozs., and add to it 2 fluid drachms of oleoresin of ginger; shake, add 2½ lbs. of finely powdered pumice stone, and agitate thoroughly at intervals of one-half hour for 12 hours. Then add 1 gallon 3 pints 4 fl. ozs. of water in quantities of 16 ozs. at each addition, shaking briskly meanwhile. This part of the operation is most important. Set the mixture aside for 24 hours, agitating it strongly every hour or so during that period. Then take oil of lemon, 1½ fl. ozs.; oil of rose (or geranium), 3 fl. drms.; oil of bergamot, 2 fl. drms.; oil of cinnamon, 3 fl. drms.; magnesium carbonate, 3 ozs. Rub the oils with the magnesia in a large mortar and add 9 ozs. of the clear portion of the ginger mixture, to which has been previously added 2 ozs. of alcohol, and continue trituration, rinsing out the mortar with the ginger mixture. Pass the ginger mixture through a double filter, and add through the filter the mixture of oils and magnesia. Finally pass enough water through the filter to make the resulting product measure 2 gallons, 3 pints, 4 ozs.

Soluble Extract of Ginger Ale for Bottlers' Use. (Formula No. 2, to be used in the proportion of 1 oz. to 6 pints 8 ozs.) Ginger, in moderately fine powder, 6 lbs.; capsicum, in fine powder,

2½ lbs.; alcohol, a sufficient quantity. Mix, and moisten the powder with 48 fl. ozs. of alcohol, and set aside in a suitable vessel for four hours. Then pack the powder firmly in a cylindrical percolator, and percolate until 96 fl. ozs. of extract are obtained. Set this mixture aside, and label percolate No. 1, and continue the percolation with 24 fl. ozs. of alcohol mixed with 24 fl. ozs. of water. Set the resultant tincture aside, and label percolate No. 2. Take: oleoresin ginger, 5 fl. ozs., and add to percolate No. 1. Then take: oil of lemon, 1½ fl. ozs.; oil of cinnamon, 1 fl. oz.; oil of geranium, ½ fl. oz.; magnesium carbonate, 8 ozs. Triturate the oils with the magnesia, add gradually percolate No. 2, and set aside. Then place percolate No. 1 in a large bottle, add 3¼ lbs. of finely powdered pumice stone, and shake at intervals of half an hour for six hours. This being completed, add the mixture of oils, and later 1 gallon of water in quantities of 8 fl. ozs. at a time, shaking vigorously after each solution. Let the mixture stand for 24 hours, shaking it at intervals, and then pass it through a doubled filter. Finally, add enough water through the filter to make the product measure 2 gallons, 3 pints, 4 ozs.

Soluble Extract of Ginger Ale for Bottlers' Use. (Formula No. 3, to be used in proportion of 3 ozs. in 6 pints, 8 fl. ozs. of syrup.) Ginger, in moderately fine powder, 8 lbs.; capsicum, in moderately fine powder, 2 lbs.; alcohol, q.s. Mix, moisten with alcohol, and set aside as in the preceding formula. Then percolate with alcohol until 1 gallon of extract is obtained. To this add oleoresin of ginger 3 drs., and place in a large bottle. Add 2½ lbs. of powdered pumice stone, and shake as directed for formula No. 1. Then add 1 gallon, 3 pints, 4 fl. ozs. of water in quantities of 16 fl. ozs. at a time, shaking vigorously after each addition. Set the mixture aside for 24 hours, shaking at intervals. Then take: oil of lemon, 1½ fl. ozs.; oil of geranium, ½ fl. oz.; oil of cinnamon, 3 fl. drs.; magnesia carbonate, 3 ozs. Rub these in a mortar with the magnesia, and add 9 ozs. of the clear portion of the ginger mixture mixed with 2 ozs. of alcohol, rubbing the mixture until it becomes smooth. Prepare a double filter, and filter the ginger mixture, adding through the filter the mixture of oils and magnesia. Finally add enough water through the filter to make the final product measure 2 gallons, 3 pints, 4 fl. ozs.

If these formulas are properly manipulated the extracts should keep for a reasonable length of time without a precipitate. If, however, a precipitate occur, after the extract has stood for a week it should be refiltered.

Glycerin as a Medium for Antiseptics. Von Wanschheim (*Wien. klin. Woch.*, through *B. M. J. Epit.*) has investigated the efficacy of various antiseptics when dissolved in glycerin. The most important results were obtained with glycerin of carbolic acid, which has been commonly substituted for carbolic oil, since Koch proved that carbolic acid lost all power as a disinfectant when mixed with oil or absolute alcohol. Glycerin itself has some power as a disinfectant both when pure and when moderately diluted with water; less than 30 per cent. glycerin has no effect on *bacterium coli* or *staphylococcus aureus*, and but little on the *cholera vibrio*; 50 to 70 per cent. glycerin kills the *staphylococcus* more quickly than pure glycerin, whilst pure glycerin kills *bacterium coli* in a few days, but when diluted has little effect on it. Owing to this antiseptic action of glycerin it would appear theoretically to be an excellent medium for antiseptics. Practically, however, this is not the case. With three exceptions all the substances used in the writer's experiments developed a much feebler antiseptic power when diluted with glycerin than when mixed with water. This applies to solutions of sulphuric acid, ½ per cent.; oxalic acid, 1·89 per cent.; caustic potash, 1·5 per cent.; carbolic acid, orthocresol, paracresol, and metacresol, ½ per cent.; creolin, 2 per cent.; lysol, 2 per cent.; saprol, 2 per cent.; formol, 2 per cent.; tannin, 10 per cent.; and thymol, 1 per mille. For instance, the lysol solution with glycerin failed to kill *staphylococcus aureus* after thirty minutes, while the watery solution, after the addition of an emulsion of staphylococcus, was sterile after five minutes. The three exceptions to this rule are (1) glacial acetic acid, which has the same bactericidal power with glycerin as with water, also acetone and hydrochloric acid, which are more powerful bactericides when mixed with glycerin than when diluted with water. The addition of glycerin to antiseptic soaps likewise lessens greatly their antiseptic value. Thus a 10 per cent. solution of soft soap in pure glycerin to which 5 per cent. of carbolic acid is added requires thirty minutes to destroy *staphylococcus*, while a solution made with soap and water instead of water and glycerin requires only five minutes; 2½ and 5 per cent. solutions of carbolic acid in glycerin have no antiseptic action whatever, though a 10 per cent. solution in glycerin has the same value as one of equal strength in water. It is a remarkable fact that the addition of water to solutions of carbolic acid in pure glycerin increases their antiseptic power, so that a 5 per cent. solution of carbolic acid in pure glycerin, which is useless as an

antiseptic, becomes efficient when it is reduced to a $2\frac{1}{2}$ per cent. solution by the addition of an equal quantity of water. In the same way an efficient 10 per cent. solution of carbolic acid in pure glycerin becomes useless if reduced to a 5 per cent. solution by the addition of glycerin, but remains efficient if reduced to a 5 per cent. solution by the addition of water. In fact, a solution of carbolic acid in equal parts of glycerin and water is equal as a disinfectant to a solution of the same strength in water alone. Hence carbolic acid, when used as an antiseptic, should not be mixed with pure glycerin in concentrations of less than 10 per cent., or, if less concentrated solutions are required, the glycerin should be diluted with an equal quantity of water.

Hair Curling Liquid. (*Amer. Drugg.*, xxxvii. 218.) Carbonate of potash, 3 drs.; strong solution of ammonia, 2 drs.; glycerin, 2 drs.; rectified spirit, $1\frac{1}{2}$ ozs.; distilled water to produce, 20 ozs. Mix. Moisten the hair with a little of the fluid and adjust lightly. It will curl up as it dries. Any grease or fat should be removed before using this by thoroughly washing the head with soft soap.

Hair Curling Powder. (*Meyer Brothers' Druggist*, xxi. 331.) Borax, powder, 1 oz.; gum arabic, powder, $\frac{1}{2}$ oz.

Mix intimately and divide into six packages.

Directions: Dissolve the contents of the packet in a teacupful of hot water.

Hair Wash, Rum and Quinine. (*Bull. of Pharm.*, xv. 145.) Oil of rose geranium, 3 drs.; oil of sweet orange, 10 drs.; oil of bergamot, 10 drs.; tincture of cantharides, 4 ozs.; balsam of Peru, $2\frac{1}{2}$ ozs.; soap liniment, 15 ozs.; alcohol (90 per cent.), 35 ozs.; tincture of cinchona, 7 ozs.; eau de Cologne, 35 ozs.; carmine, 45 grains; brandy, q.s. to produce 1 gal., 6 pints, 8 ozs. Mix, allow to stand for a month; then filter.

Hydrogen Peroxide as a Preservative for Food. Jablin. Gonnet. (*Chem. Centr.*, lxxii. 1173.) The author has taken daily for 2 months a pint of milk with 8 per cent. hydrogen peroxide (12 volumes) without experiencing any ill effects. The peroxide was freed from acid by means of calcium carbonate. One c.c. preserves one litre of milk for 2 days; 2 c.c. for 4 days; 3 c.c. for 6 days.

Ink Tablets or Ink Stones. According to the *Metallarbeiter* (through *Nat. Drugg.*, xxx. 352) excellent ink may be prepared extemporaneously by dissolving the following extract in the requisite quantity of water: Aleppo gall apples, 84 parts; madder (Dutch), 6 parts. Powder, mix, and pack into a percolator, extract with hot

water, filter and press out. To the filtrate add 11 parts of iron sulphate and dissolve. To the solution add 4 parts of iron acetate (or pyroacetate) and 2½ parts of tincture of indigo. Put the whole into the waterbath and evaporate to dryness. Make into a mass with mucilage of gum-arabic, and divide into tablets of the desired size.

Iridescent Colours, to produce, on Zinc. (*Nat. Drugg.*, xxx. 276.) Clean the surface and immerse in a bath consisting of 3 parts cupric tartrate and 4 parts potassic hydrate, dissolved in 40 parts of distilled water. About two minutes suffice to produce a violet tint, which, on longer immersion, successively passes into a blue, green, golden yellow, and, finally, at the end of eight and a half minutes, into a beautiful purple.

Labels; to Fix Permanently. (*Spatula*, vi. 474.) Heat gelatin 100 in acetic acid (36 per cent.) until dissolved, and add glycerin 10. Dissolve potassium bichromate 20 in water 200. Immediately before use mix 2 parts by weight of the gelatin solution, liquefied by heat, with 1 part of the bichromate solution, and apply in the usual manner. When dry, the labels will not be detached by hot or cold water, by alcohol or by ether.

Lanoline Toilet Cream. (*Pharm. Post*, xxxiv. 68.) Anhydrous lanoline, 650 Gm.; peach kernel oil, 150 Gm.; perfumed with ionone 15 drops, or synthetic ylang ylang oil, 20 drops.

Laundry Blue. (*Pharm. Centr.*, xlii. 402, after *Siefenfabrikant.*) Dissolve potassium ferrocyanide 217 in water 1000, and, separately, ferric chloride 100 in the same amount of water. Make saturated sodium sulphate solution 4000 and add 2000 to each of the two solutions first made; then gradually add the iron mixture to the ferrocyanide with constant stirring. Collect the precipitate, wash it until the wash-water begins to pass tinted with blue, then drain and dry. The dry powder mixed with mucilage makes a good stamping ink.

Leather Dressing with a High Glaze. (*Nat. Drugg.*, xxx. 317.) In 80 parts of boiling water dissolve 4 parts of borax, and to the solution add, a little at a time, with stirring, 10 parts of light-coloured shellac. Maintain the heat and stirring until the gum is dissolved. Let boil for half an hour, then add and stir in, in the order named, 10 parts of granulated sugar, 5 parts of glycerin, and 3 parts of nigrosin, stirring until all are dissolved. Remove from the fire, let cool down to about 140° F., then add 5 parts of wood alcohol of 95 per cent., and stir in thoroughly.

Mucus, Toxic Action of. Charrin and Moussu (*Comptes rend.*, cxxxii. 164) find that when mucus is injected directly into the circulation it has a very marked toxic effect, a dose of 0·05 to 0·15 Gm. per kilo. of body weight being fatal in the case of rabbits. It appears to act mechanically, causing clotting and coagulation of the blood. Animals which have previously been treated with an injection of extract of leeches, which prevents blood coagulation, are found to be immune to the toxic action of mucus. These experiments point to the profound influence exercised on the vital function by even the most widely distributed animal secretion when applied to the system out of its normal position. The nature of the coagulating principle of mucus has not yet been determined.

Mustards, prepared, of Commerce. (*Nat. Drugg.*, xxx. 436.) The mustard, *i.e.* the flour or powdered seed used in preparing the different condiments, is derived from three varieties of Brassica—*Brassica alba L.*, *Brassica nigra*, and *Brassica juncea.* The first yields the "white" seed of commerce, which produces a mild mustard; the second the "black" seed, yielding the more pungent powder, and the latter a very pungent and oily mustard, much affected by the Russians. The pungency of the condiment is also modified by the method of preparing the paste, heat destroying the sharpness completely, if carried too far. The pungency is further controlled and tempered, in the cold processes, by the addition of wheat or rye flour, which also has the advantage of serving as a binder of the mustard. Mustard flour is prepared by first decorticating the seed, then grinding to a fine powder, the expression of the fixed oil from which completes the process. This, unlike the volatile oil, is of a mild, pleasant taste, and of a greenish colour, which, it is said, makes it valuable in the sophistication and imitation of "olive" oils, refined cotton-seed, or pea-nut oil being thus converted into *huile vierge de Lucca*, *Florence*, or some other noted brand of olive oil. It is also extensively used for illuminating purposes, especially in Southern Russia.

The flavours, other than that of the mustard itself, of the various preparations are imparted by the judicious use of spices, cinnamon, nutmeg, cloves, pimento, etc.; aromatic herbs, such as thyme, sage, chervil, parsley, mint, marjoram, tarragon, etc., and finally chives, onions, shallots, leeks, garlic, etc.

In preparing the mustards on a large scale, the mustard flour and the wheat or rye flour are mixed and ground to a smooth paste with vinegar, must (unfermented grape juice), wine, or whatever is used in the preparation, a mill similar to a drug or paint mill

being employed for the purpose. This dough immediately becomes spongy, and in this condition, technically called "cake," is used as the basis of the various mustards of commerce.

Mustard Cakes.—In the mixture, the amount of flour used depends on the pungency of the mustard, and the flavour desired to be imparted to the finished product. The cakes are broadly divided into the yellow and the brown. A general formula for the Yellow Cake is: Yellow mustard, from 20 to 30 per cent.; salt, from 1 to 3 per cent.; spices, from $\frac{1}{4}$ to $\frac{1}{2}$ of 1 per cent.; wheat flour, from 8 to 12 per cent. Vinegar, must, or wine, complete the mixture.

The Brown Cake is made with black mustard, and contains about the following proportions: Black mustard, from 20 to 30 per cent.; salt, from 1 to 3 per cent.; spices, from $\frac{1}{4}$ to $\frac{1}{2}$ of 1 per cent.; wheat or rye flour, from 10 to 15 per cent.

The variations are so wide, however, that it is impossible to give exact proportions. In the manufacture of table mustards, in fact, as in every other kind of manufacture, excellence is attained only by practice and the exercise of sound judgment and taste by the manufacturer. The formulæ for some of the best known brands of imported table mustards are stated to be as follows:—

Moutarde des Jesuittes.—Twelve sardels and 280 capers are crushed into a paste and stirred into 3 pints of boiling wine-vinegar. Add 4 ozs. of brown cake and 8 ozs. of yellow cake, and mix well.

Kirschner Wine Mustard.—Reduce 6 gallons of freshly expressed grape juice to half that quantity, by boiling over a moderate fire. Dissolve in the boiling liquid 5 pounds of sugar, and pour the syrup through a colander containing 2 or 3 large horseradishes cut into very thin slices and laid on a coarse towel spread over the bottom and sides of the colander. To the colate add the following, all in a state of fine powder: Cardamom seeds, $2\frac{1}{2}$ drs.; nutmeg, $2\frac{1}{2}$ drs.; cloves, $4\frac{1}{2}$ drs.; cinnamon, 1 oz.; ginger, 1 oz.; brown mustard cake, 6 lbs.; yellow mustard cake, 9 lbs. Grind all together to a perfectly smooth paste, and strain several times through muslin.

Duesseldorff Mustard.—Brown mustard cake, 10 ozs.; yellow mustard cake, 48 ozs.; boiling water, 96 ozs.; wine vinegar, 64 ozs.; cinnamon, 5 drs.; cloves, 15 drs.; sugar, 64 ozs.; good white wine, 64 ozs. Mix after the general directions given above.

German Table Mustard.—Laurel leaves, 8 ozs.; cinnamon,

5 drs.; cardamom seed, 2 drs.; sugar, 64 ozs.; wine vinegar, 96 ozs.; brown cake, 10 ozs.; yellow cake, 48 ozs. Mix after general directions as given above.

Krems Mustard, Sweet.—Yellow cake, 10 ozs.; brown cake, 20 ozs.; fresh grape juice, 6 pints. Mix and boil down to the proper consistency.

Krems Mustard, Sour.—Brown mustard flour, 30 parts; yellow mustard flour, 10 parts; grape juice, fresh, q.s. Mix and boil down to a paste and then stir in 8 parts of wine vinegar.

Tarragon Mustard.—Brown mustard flour, 40 parts; yellow mustard flour, 20 parts; vinegar, q.s.; tarragon vinegar, 6 parts. Boil the mustard in the vinegar to a paste and add the tarragon vinegar.

Tarragon Mustard, Sharp.—This is prepared by adding to every 100 lbs. of the above 21 ozs. of white pepper, 5 ozs. pimento, and 2½ ozs. cloves, mixing thoroughly by grinding together in a mill, then put in a warm spot and let stand for 10 days or 2 weeks. Finally strain.

Moutarde aux Épices.—Mustard flour, yellow, 10 lbs.; mustard flour, brown, 40 lbs.; tarragon, 1 lb.; basil, herb, 5 ozs.; laurel leaves, 12 drs.; white pepper, 3 ozs.; cloves, 12 drs.; mace, 2 drs.; vinegar, 1 gal. Mix the herbs and macerate them in the vinegar to exhaustion, then add to the mustards and grind together with vinegar q.s. Set aside for a week or 10 days, then strain through muslin.

Another form—also called *Moutarde Aromatisée.*

Boil together 2 lbs. of brown and 4 lbs. of yellow mustard flour in 1 gal. of vinegar; then add oil of tarragon, 1 oz.; oil of thyme, 4 drs.; oil of mace, 2 drs.; oil of cloves, 75 minims, dissolved in 4 ozs. alcohol, and a pint of the strongest vinegar.

Moutarde Hygienique.—Yellow mustard flour, 20 ozs.; brown mustard flour, 12 ozs.; salt, 3 ozs.; wine vinegar, 16 ozs. Make a tincture of pimento, 3 drs.; cassia bark, 1 dr.; ginger, 1 dr.; white pepper, 1 dr.; alcohol, 12 drs. Let stand for several days, then add to the mustard, and grind together with 3 ozs. of sugar and 8 ozs. of water.

In all the foregoing formulæ where the amount of salt is not specified, it is to be added according to the taste or discretion of the manufacturer.

Tarragon vinegar is made by macerating 1 part of tarragon (the herb) in 10 parts of strong white wine vinegar.

Mustard vinegar is prepared as follows: Celery chopped fine, 32 parts; tarragon, the fresh herb, 6 parts; cloves, coarsely

powdered, 6 parts; onions, chopped fine, 6 parts; lemon peel, fresh, chopped fine, 3 parts; white wine vinegar, 575 parts; white wine, 515 parts; mustard seed, crushed, 100 parts.

Mix and macerate together for a week or 10 days in a warm place, then strain off.

Nursery Powder, Berlin. (*Amer. Drugg.*, xxxvii. 218.) Salicylic acid, 2 parts; talcum, 100; lycopodium, 100; starch, in finest powder, 50; zinc oxide, 20. Mix intimately by sifting several times. This powder not only is very grateful to the tender skin, but it rapidly heals chafes and other similar injuries.

Ointment for Burns. H. Bohnert's ointment for burns (*Pharm. Post*, xxxiii. 703) has the following composition: Linseed oil, 50; prepared suet, 15; yellow wax, 30; carbolized oil, 5.

Ointment for Chaps and Cracked Hands. (*Journ. Pharm. Chim.* [6], xiii. 400.) Menthol, 3; salol, 4; olive oil, 4; lanoline, 80. To be applied twice daily night and morning.

Paste for Labels on Tin. (*Nat. Drugg.*, xxx. 391.) The following formula produces an excellent universal paste that will stick paper on glass, wood or metal: Gum arabic, 42 parts; tragacanth, in powder, 32; glycerin, 180; alcohol, 15; thymol, q.s., or, say, 1 part; water, sufficient to make 500 parts. Dissolve the gum arabic in 60 parts of water, rub up the tragacanth with 120 parts of water, and mix the two liquids. Pass the mixture through a fine sieve, and add the glycerin. Dissolve the thymol in the alcohol, and add it to the mixture, working it all well up together, in the meantime adding the rest of the water. The following is a simpler but excellent paste, which makes a pure white mixture of excellent adhesive powder: Tragacanth, in powder, 2 parts; boiling water, 40; wheat flour, 6; white dextrin, 1 part; cold water, 4 parts. Mix the tragacanth with 16 parts of the boiling water, stir well, and set aside. Mix the flour and dextrin with the cold water and add it to the tragacanth. Now have the residue of the water in active ebullition and pour it on the mixture, stirring it in thoroughly while it is being poured. Add 1 part of glycerin and about the same amount of salicylic acid, and stir well in. Now let the whole boil for three or four minutes, stirring all the time.

Perfumes, Manufacture of, from Concrete Essences. G. C. De Lessing. (*Chem. and Drugg.*, lxiii. 117.) The author advocates the use of the new form of concrete essences in place of pomades, for the manufacture of the floral essences used in compounding perfumes. He claims that the process of preparation is simpler, that no cooling is required before filtering, and that there is no

residual product of exhausted fat, which is often a source of trouble to the perfumer. The following is the *modus operandi:* Take 6 dr. of the concrete perfume (any odour except violet) for 128 ozs. of 90 per cent. alcohol. In the case of violet use 4 drs. for 128 ozs. of alcohol.

Put the concrete essence in a large mortar, add about 1 dr. of alcohol and triturate, making first a thick paste and breaking all lumps. Add more alcohol and triturate well, adding alcohol until about a pint of liquid is produced; transfer to a 2-gallon jar and wash out the mortar with alcohol to make 128 ozs. of essence. Shake many times during twenty-four hours. This constitutes the first washing, and it is now ready for separation from the mass by filtering. The undissolved portion is collected on a filter and shaken with another 128 ozs. of alcohol, filtered after twenty-four hours, and the process repeated a third time. Each washing is preserved and marked as first, second and third washings.

For retail businesses seven leading odours are necessary, viz., cassia, jasmine, orange, rose, tuberose, lily of the valley and violet. In compounding the perfumes the whole value of the washings is calculated in first washing, and second and third washings are used for adjusting price to the demands of trade. The great advantage of having second and third washings is that instead of ordinary rectified spirit (with its alcoholic odour) generally used for reducing the cost of perfumes, the manufacturer is enabled to use an alcoholic menstruum having a certain flowery odour. On the larger scale and for more proficient work, specially constructed shaking machines are available. The following formulæ are compounded with these products.

White Rose.—Jasmin, concrete, washing No. 1, 2 lbs. 5 ozs.; violet, concrete, washing No. 3, 2 lbs. 7 ozs.; violet, concrete, washing No. 1, 1 lb. 2 ozs.; oil of neroli (synthetic), 10 grs.; oil of patchouli or asarum Canadense, 20, oil of rose-geranium, $\frac{1}{2}$ dr.; spirit of rose oil (1 per cent.), $1\frac{1}{2}$ lbs.; tincture of orris root, $\frac{1}{2}$ oz. All by weight. Mix, let stand for two or more hours, and then add 1 lb. of rose or ordinary water in small quantities, shaking well after each addition. Let stand for twenty-four hours, and filter through linen and finely-powdered fullers' earth.

Heliotrope Bouquet.—Orange, concrete, washing No. 3, 8 lbs.; heliotropol, $3\frac{9}{16}$ ozs.; oil of ylang-ylang (synthetic), 80 grs.; oil of neroli (synthetic), 27 grs.; spirit of rose oil (1 per cent.), $\frac{1}{2}$ oz.; ionone (10 per cent.), 43 grs. Mix well, and keep in stock as "oil of heliotrope." To make inexpensive heliotrope bouquet, take by

weight: Oil of heliotrope, 120 ozs.; rose, concrete, washing No. 3, 100; rose or ordinary water, 180. Mix well. Let stand for twenty-four hours, and filter, using finely-powdered fullers' earth.

Jockey Club.—Cassie, concrete, washing No. 1, 4 lbs.; jasmin, concrete, washing No. 1, 10 lbs. 10 ozs.; tuberose, concrete, washing No. 1, 9 lbs. 9 ozs.; tincture of ambergris (1 per cent.), 9 lbs. 9 ozs.; tincture of civet (1 per cent.), 9 lbs. 7 ozs.; spirit of musk Baur (1 per cent.), 12 ozs.; tincture of orris root, 60; tincture of Peru balsam, 3; tincture of storax, 6; spirit of rose oil (1 in 64), 10 lbs.; spirit of vanillin (1 in 64), $1\frac{1}{2}$ lbs.; oil of bergamot, 11 ozs.; oil of cloves, $\frac{1}{2}$ oz.; oil of lavender (French), 1; oil of neroli (synthetic), $\frac{11}{16}$ oz.; oil of santal, $1\frac{1}{8}$ oz.; spirit of heliotropol (1 in 16), $4\frac{1}{2}$ ozs.; orange, concrete, washing No. 3, 20 lbs.; rose or ordinary water, 2. Keep this mixture for some days, shaking occasionally. Label "Oil of Jockey Club." To make inexpensive Jockey club bouquet, take: oil of Jockey Club, $2\frac{1}{4}$ lbs.; cassie, concrete, washing No. 3, $3\frac{3}{4}$; rose or ordinary water, 2.

Violet Bouquet.—Jasmin, concrete, washing No. 3, 3 lbs.; spirit of orris oil, concrete (1 per cent.), $12\frac{1}{4}$ ozs.; spirit of musk Baur (1 per cent.), $7\frac{1}{8}$ oz.; oil of lignaloe, 8 grs.; oil of bergamot, 8 grs.; oil of lemon, 12 grs.; rose or ordinary water, 49 ozs. Mix well, and after two or three days filter through finely-powdered fullers' earth.

White Lilac.—Rose, concrete, washing No. 3, 10 lbs.; tuberose, concrete, washing No. 3, 10 lbs.; lily of the valley, concrete, washing No. 3, 10 lbs.; orange, concrete, washing No. 3, 10; jasmin, concrete, washing No. 3, 4 lbs.; oil of muguet (Dessire), $1\frac{15}{16}$ oz.; oil of rose geranium, 34 grs.; oil of rosezone (artificial rose oil), 128 grs.; spirit of cedar-leaves oil (1 in 64), $1\frac{3}{4}$ oz.; spirit of musk Baur (1 per cent.), 64 grs. Mix, and after three days filter.

Apple Bloom Bouquet.—Oil of ylang-ylang (synthetic), 1 oz.; oil of lignaloe, 8 ozs. Mix well and keep in stock for some time. Label "oil of apple-bloom." To make an inexpensive bouquet, take: Violet, concrete, washing No. 3, 79 ozs.; oil of crab apple, 2 ozs.; tincture of cloves, 2 ozs.; spirit of musk Baur (1 per cent.), 4 ozs.; water, 41 ozs. The above directions are given for the preparation of cheaper articles, but so-called oils can be used in greater quantity than suggested to produce a suitable article.

Perspiring Feet, Remedies for. (*Pharm. Zeit.*, xlvi. 122.) (1) (*a*) French chalk, 100; alum, 20; barley meal, 50; salicylic acid, 2. (*b*) French chalk, 100; wheat starch, 200; alum, 60; boric acid, 4. (2) (*a*) Peru balsam, 1; formic acid, 5; chloral hydrate, 5; absolute alcohol, 89; to be rubbed in with a wad. (*b*) Alumnol, aristol,

of each 4; starch, 15; dusting powder. (*c*) A solution of iron chloride as well as a 1 per cent. solution of borax with tincture of benzoin and tincture of myrrh is recommended as a wash for the feet. (*d*) Borax, 75; salicylic acid, 75; boric acid, 2; glycerin, 100; and alcohol, 100. (*e*) Powdered boric acid is also recommended. (3) *Remedies for perspiration of hands and feet.*—(*a*) Formaldehyde and water in equal parts should be painted on the hands and feet morning and evening. This should not be used if there are any wounds. (*b*) As a remedy for excessive perspiration in various parts of the body, as well as for sores, and the unpleasant smell of perspiration, tannoform is recommended in the form of a powder, or as a 10 per cent. ointment or soap. (4) When the feet are affected, but not macerated or reddened (*a*) if the sole is affected, paint with formalin, taking care not to inhale the vapour. (*b*) If the spaces between the toes are affected they should be daily powdered with tannoform if formalin cannot be borne. (*c*) When the sole as well as the spaces between the toes are affected, the former should be painted with formalin, and the latter with tannoform. (5) In cases where maceration is found tannoform should be brushed on daily until healed, then apply the above remedy.

Phosphated Quinine Wine. (*Chem. and Drugg.*, lviii. 445.) Monocalcic phosphate, ʒiv.; distilled water, ʒiv.; simple syrup, ℥iij.; quinine wine to 35 fl. ozs. A small wineglassful to be taken after the principal meal.

Platinum in Ancient Egyptian Inscriptions. Berthelot. (*Comptes rend.*, cxxxii. 729.) The interesting discovery of platinum among the metals employed by the ancient Egyptians carries the use of the metal farther back by some thousands of years than any previously traced use. In the present state of knowledge of the metals employed in these sacred writings it is not possible to determine if the use of platinum in this instance was accidental or intentional. The letters had evidently been beaten out with a hammer in the same manner as those of gold and silver in the same inscription.

Polishing Cloths. (*Nat. Drugg.* after *West. Drugg.*, xxxiii. 80.) No. 1, the cleaner, or cloth first to be used on brass, steel, etc., or any of the baser metals, is obtained by impregnating a piece of stuff with the following: Finest flour of emery, 5 parts; white soap, 10; water, sufficient, say 50. Dissolve the soap in the water by the aid of heat and stir the emery into the solution. Dip the cloths in separately and impregnate thoroughly, wring out and hang out to dry. No. 2, the polisher proper, is impregnated with

the following: Fine Tripoli, 5 parts; Castile soap, 10; water, sufficient. Proceed as before. Jeweller's rouge might be used instead of Tripoli, with advantage, as it would distinguish the cloth by its colour.

After the cloths are dry they should be shaken over a vessel to get rid of surplus powder, which may be returned to the dipping vessel and used again, each cloth being shaken over its own pan.

For very dirty articles a strong aqueous solution of oxalic acid should be used with the cleaning cloth.

Polishing Wax. (*Pharm. Zeit.*, xlvi. 305.) Yellow wax and carnuaba wax, 10, are melted together and mixed with turpentine, 45, and benzine, 40. Colour with oil soluble aniline yellow.

Pomade, Cantharides. (*Nat. Drugg.*, xxx. 353, after *Zeits. für Kosmetik.*) Tincture of cantharides, 28 parts; white wax, 100; oil of mace, 3; clove oil, 3; attar of rose, 2; beef marrow, 900. Mix and make a pomade.

Pomade, Quinine. (*Nat. Drugg.*, xxx. 353, after *Zeits. für Kosmetik.*) Quinine sulphate, 3 parts; Peru balsam, 3; oil of sweet almond, 55; lard, 255; beef marrow, 325; clove oil, 7; attar of rose, 2. Mix, and make a pomade.

Preserving Mushrooms. (*Chem. and Drugg.*, lviii. 445.) The "Appert" process, which is used by most manufacturers, is as follows: The mushrooms are peeled and placed in water slightly acidulated with vinegar. They are then allowed to drain, after which they are parboiled, and placed, one by one, in wide-mouthed bottles which are filled three-fourths full with a weak solution of vinegar. The bottles are now well corked and placed in a saucepan of cold water, the bottom of which is covered with straw. The bottles are also wrapped in straw, to prevent them breaking. The saucepan is then put on the fire, and the water brought to boil and kept at that for ten minutes. The saucepan is then taken from the fire and the water allowed to cool gradually, after which the bottles are removed and sealed with wax.

Putz Pomades. (*Nat. Drugg.*, xxx. 245.) The *Journal der Goldschmiedekunste* gives the following formulæ for polishing pomades:

1. Anhydrous sodium carbonate, 5 parts; tallow soap, 20; levigated emery, 100; water, 100. Mix, put on the water-bath and heat, under constant agitation, until a smooth homogeneous paste has been obtained.

2. Jeweller's rouge, 1 part; petrolatum, 1; oil of mirbane, q.s. to perfume. Mix intimately.

3. Oil of turpentine, 1 part; levigated emery, finest, 1; jeweller's rouge, 2; petrolatum, 2; oil of mirbane, q.s. Rub up together to a homogeneous pomade.

4. Emery flour, finest levigated, 50 parts; jeweller's rouge, finest, 50; mutton suet, 40; oleic acid, crude, 40; perfume, q.s. Melt the suet and oleic acid together in the waterbath, and when thoroughly mixed remove from the fire. When cooled down, but still soft, add the powders, and rub up until they are evenly distributed throughout the mass. The perfume may be added at the same time as the powders.

5. Stearin, 8–9 parts; mutton suet 32–38; neatsfoot oil, 2–2·5; jeweller's rouge, finest levigated, 20; levigated calcium carbonate, 40–60. Melt the suet, stearin and oil together, and proceed as in No. 4.

6. Quartz sand, powdered and levigated, 20 parts; jeweller's rouge, finest levigated, 30; vaselin, 50. Mix. Instead of quartz sand, levigated infusorial earth may be used.

Quinine and Rum Hair Wash. (*Bull. of Pharm.*, xv. 145.) Oil of rose geranium, 3 drs.; oil of sweet orange, 10 drs.; oil of bergamot, 10 drs.; Peruvian balsam, 2½ ozs.; tincture of cantharides, 4 ozs.; tincture of cinchona, 7 ozs.; soap liniment, 15 ozs.; alcohol (90 per cent.), 35 ozs.; eau de cologne, 35 ozs.; carmine, 35 grs.; brandy, q.s. to make 1 gal. 6 pints 8 ozs. Mix and allow to stand for a month, then filter.

Rat Pastilles—Rat Fritters. A pastille or "cooky" that rats are very fond of, to their sorrow, may be prepared as follows (says the *Drogisten Zeitung*, through *Nat. Drugg.*, xxx. 353).

Cut a squill into thin slices, dry the latter and pound them up. To the powder add pulverized sugar flour, a little salicylic acid, and enough of a mixture of glycerin and water to make a paste. Roll out, and with a tin lip-salve-box cover, or a cutter the size of a silver dollar, cut up into pastilles and dry. To use, moisten with water, and dust with powdered sugar.

Rat Fritters. Another dainty titbit for the "vermin" is a fritter, prepared as follows: Chop up a fresh squill bulb into very small bits, add a tablespoonful of flour and one of milk, and make into a fritter. Have some bacon grease hot, drop in the fritter and cook quickly. Let cool, and put where the rat can get at it. This is all that is necessary to do for that rat.

Sachet Perfumes. (*Amer. Drugg.*, xxxvii. 72.) *Violet.* Orris powder, 500 parts; rice flour, 250; essence of bonquet extract, 10;

spring-flowers extract, 10; violet extract, 20; oil of bergamot, 4; rose oil, 2; musk tincture, 50.

Dreamland. Caraway, 125 parts; mint, 125; thyme, 125; lavender, 125; rose petals, 500; cloves, 70; musk tincture, 50.

Rose. Rose petals, 1,000 parts; sandalwood powder, 600; rose oil, 15.

Portugal. Sandalwood powder, 1,000 parts; orris powder, 500 rose petals, 500; cinnamon, 250; cloves, 250; Tonquin musk, 10.

Vanilla. Styrax, 675 parts; Siam bezoin, 675; rosewood, 675 cloves, 160; vanilla, 160; Tonquin musk, 10.

The popular granular sachet powders are made by substituting bran powder for orris.

Salol Tooth Powder, Robin. (*Amer. Drugg.*, xxxvii. 247.) Salol, 5 parts; calcium phosphate, 25; calcium carbonate, 25; magnesium carbonate, 25; sodium bicarbonate, 13; peppermint oil, q.s.; carmine, q.s.

Schleich's Skin Remedies. (*Chem. and Drugg.*, lvii. 138.) *Cerate-Paste.* Melt 1 kilo. of yellow beeswax in a large evaporating dish on a water-bath. Remove the water-bath from the fire and drop in 100 Gm. of strong solution of ammonia. Stir constantly until thickening takes place; but the stirring must be done lightly. Again place on the water-bath, and stir until a homogeneous, bright-yellow, soft, anhydrous liquid mass is obtained, free from lumps. Neutralise the acidity of the emulsion by the addition of ammonia.

Pulvis Serosus c. Glutol. Mix equal parts of glutol and pulvis serosus. Then prepare the mixture as follows: Zinc seros. (finely powdered), 150 Gm. (sterilised at about 100° C.); spirit, to dissolve 10 Cgm.; oil of citronella, 10; eosin, 10. Macerate continuously for 36 hours, then collect on a filter, and dry.

Mercury Pencil. Metallic mercury, 50 Gm.; peptone-paste, 100; cacao-butter, 15; distilled water, 20. Mix and divide in pencils of from 15 to 20 Gm. each. To be rubbed on the part until complete blackening of the skin and dryness takes place.

Ichthyol Mercury Peptone. Metallic mercury, 100 Gm.; peptone-paste, 100. Rub together, and add: peptonated paste, 200 Gm.; cacao-butter, 30; distilled water, 30; ichthyol, 15.

Ointment-bandages. For each bandage measuring 8 c.m. broad and 5½m. long use 250 Gm. of skin-cream or pure unmixed vaseline-wax. This is warmed and kneaded thoroughly (with perfectly clean hands) through each bandage so that each thread of the

bandage is saturated. The bandages are then rolled and wrapped in antiseptic paper. Lastly, add 5 per cent. of ichthyol or formalin.

Stearin-Paste or Steral. This is made in exactly the same way as the wax-paste, using stearic acid instead of wax.

Serum-Paste. Ox-blood serum, fresh from the slaughter-house, is mixed with 500 parts of finely powdered oxide of zinc. For smaller quantities sterilised-blood serum from the bacteriological laboratories may be used, and suitable quantities taken. Naturally the latter must be made liquid by heating before being mixed with the oxide of zinc. Then paint on glass plates, and when the powder is dry, scrape off the scales. Rub into a fine powder and sterilise for twelve hours at a temperature of about 75° C.

Wax Gelatin or Gluten-cerate. This mixture is similar to cerate-paste, using instead a 10 per cent. solution of gelatin, and preparing in the following manner: Dissolve 10 Gm. of pure gelatin in 100 Gm. of water, and shake the mixture vigorously with the yolk of an egg. Then heat the solution for two hours on a water-bath and filter. The clear solution will then be sterilised and diluted with sterilised water to a thin liquid. The gelatin is then made alkaline with a saturated solution of sodium carbonate and added to the melted and ammoniated wax. The vessel is afterwards taken from the fire and stirred till cool. Eventually the mixture is again heated with the water and ammonia until the consistence of a syrupy liquid is obtained.

Shampoo Liquid. (*Bull. of Pharm.*, xv. 146.) Tincture of green soap, 16 fl. ozs.; potassium carbonate, 1 oz.; distilled water to make 7 pts 8 fl. ozs.; perfume, q.s.

Shoe Creams, Coloured. (*Pharm. Post.*, xxxiii. 703.) I.—Yellow wax 300 is melted, and to it is added of turpentine oil 1,000; resin soap 120 dissolved in water 1,000 is then stirred in, until a frothy paste results. Nankin brown 15, or aniline green 15 dissolved in alcohol 75 may be used as colouring matter.

II.—Shoe cream for polishing yellow shoes is made of yellow vaseline, 100; olive oil, 70; ceresin, 500; and leather yellow, 1.

III.—Stearin, 10; oil of turpentine, 10; and any colouring matter, 3.

Slimy Sponge, to Clean. (*Meyer Brothers' Druggist*, xxi. 331.) Sodium chloride, 8 ozs.; ammonium carbonate, 4 ozs.; water, hot, 6 pints 8 oz. Directions: Dissolve the salts in the water and soak the sponge in the solution for an hour or two; rinse it in clean water, squeeze it out and let it dry.

Smokers' Cachous. (*Pharm. Post.*, xxxiii. 703.) Finely powdered sugar, 500; cassia bark, 20; cardamoms, 5; ginger, 10; calamus root, 10; storax, 10; ambergris, 0·25; and musk, 0·25, are thoroughly mixed in an extremely fine state of division after which neroli oil, 1; rose oil, 0·5; and oil of cloves, 0·5, are added, and the whole worked up to a stiff pill mass with tragacanth mucilage. The pills are silvered and labelled "Prince Albert Cachous."

Soup-Herbs, Essence of. (*Nat. Drugg.*, xxx. 238.) Thyme, 4 parts; winter savory, 4; sweet marjoram, 4; sweet basil, 4; lemon peel, grated, 2; shallots, 2; celery seed, 1; alcohol, 60%, 50. Bruise the herbs, which should be as fresh as possible; bruise or coarsely powder the celery seed, mix, and pour over them the alcohol. Put into a closely stoppered vessel, and let macerate together from ten days to two weeks. Filter and press off.

Spices, Savory, Essence of—(*Nat. Drugg.*, xxx. 238.) Black pepper, 64 parts; turmeric, in fine powder, 6; coriander seed, 3 oil of pimento, 3; oil of nutmeg, 1; oil of clove, 1; oil of cassia, 1; oil of caraway, 1; alcohol, 94 per cent., 125. Grind the coriander seed and black pepper, and mix in the turmeric. Dissolve the oils in a separate portion of the alcohol, add the residue of the alcohol, and pour over the powder. Put into a closely stoppered vessel, and set aside to macerate for two weeks, agitating occasionally from day to day. Filter and press off.

Staining Cilia of Bacilli. De Rossi (*Brit. Med. Journ. Epit.*, 1891, 8, after *Arch. per Sci. Med.*) recommends the following method for staining the cilia of various bacteria: A cultivation not more than four days old is taken, grown on agar—not too rich in NaCl—at a temperature of 37° C. The smallest particle is taken on a thin platinum loop and gently mixed by delicate to-and-fro movements with a little distilled water in an absolutely clean watch-glass, forming a fine milky emulsion. A loopful of this is similarly mixed with ½ to 1 c.cm. of distilled water in a second watch glass. A loop of this second dilution is placed—but not spread—on each cover glass, and these are rapidly dried in a sulphuric acid exsiccator. When dry, there ought to be but the faintest white ring at the margin of the drop, the centre being transparent, or else it is useless to go on to stain the preparation. The bottles containing the mordant and the stain are fitted with two exactly similar pipettes. The mordant is tannic acid, 25 Gm.; aqueous solution of caustic potash (1 per cent.), 100 Gm.; dissolve by heat. (This is stable, and keeps indefinitely.) The stain is

Ziehl's original carbolic fuchsine (crystallised carbolic acid, 5 Gm.; alcohol, 10 Gm.; fuchsine, 25 Cgm.; distilled water, 100 Gm.) On the cover glass, not fixed, pour one drop of the mordant and four or five drops of the stain. A precipitate is formed. Leave these on for fifteen, twenty, or twenty-five minutes (or make three cover glasses, one at each of these periods). Wash with distilled water, dry carefully with bibulous paper, and mount in balsam. A few preparations are really beautiful all over, but often only a few parts are successful. The colouration is best near the margin, but in multiciliated species the felting of the cilia is here too intricate, and a point nearer to the middle gives the best results.

Staining Flagella of Bacteria. Dr. J. B. Smith (*Brit. Med. Journ.*, 2090, 205) finds the following modification of Pitfield's method useful for general application in staining flagella: A saturated solution of perchloride of mercury made by boiling, is poured while still hot into a bottle in which crystals of ammonia alum have been placed in quantity more than sufficient to saturate the fluid. The bottle is well shaken and then allowed to cool.

To 10 c.cm. of this fluid 10 c.cm. of a freshly-made 10 per cent. solution of tannic acid are added, and 5 c.cm. of carbol-fuchsin. These are mixed and filtered. This mordant will keep for a considerable period. The cover glasses are prepared by washing in a strong solution of hydrochloric acid. They are taken from the acid, wiped with a clean cloth, and thoroughly heated over a Bunsen flame. A convenient way of doing this is to place them on a slide upon a tripod, and apply the flame. On a cover glass which has been sufficiently heated, the film spreads with perfect evenness. The traces of acid which are left on the glass make it easier to avoid subsequent precipitation of mordant or stain. The bacilli are placed on the cover slip and fixed. The mordant is then filtered, poured on the preparation, and heated till steam is given off. Boiling should be avoided, as it leads to precipitation. The preparation should be kept at this temperature for three minutes. It is then well washed in distilled water, and the stain is added, and heated in the same way for three or four minutes.

The stain is made by adding 1 c.cm. of a saturated alcoholic solution of gentian violet to 10 c.cm. of a saturated solution of ammonia alum. This is filtered and poured on the preparation.

This method can be applied generally. It is particularly applicable to bacilli of the typhoid and *B. coli* group. It has been used in the laboratory also for the staining of the flagella of *B. choleræ*

asiat., *B. tetani*, *V. aquatilis*, etc. The flagella are clearly defined and of moderate thickness. The advantage of the method is the certainty and rapidity with which results are obtained.

Sucramine. Under this name a new sweetening body has been introduced into commerce in France, as a sugar substitute. It has also been put up in similar form to lump sugar, under the name of "Sucre de Lyon," one piece of which was claimed to have ten times the sweetening power of a similar piece of sugar. J. Bellier (*Repertoire* [3], xiii. 103) has examined this substance and finds it to consist of ordinary sugar with the addition of about two per cent. of the ammonium salt of saccharin.

Sulphides, Permanent Solutions of. E. Capmartin. (*Journ. Pharm. Chim.* [6], xiii. 452.) A permanent solution of active sulphur for the extemporaneous preparation of sulphureous water may be prepared by dissolving pure crystalline sodium monosulphide 100 in alcohol, 95 per cent., 363, and glycerin, sp. gr. 1·242 537. Each 10 parts of this solution will represent 1 part of sodium sulphide. The solution should be prepared and filtered in a vessel from which air is excluded.

Theatrical Face Paints. (*Amer. Drugg.*, xxxvii. 374.) *White.*—Prepared chalk, 40 parts; zinc carbonate, 40; bismuth subnitrate, 40; powdered asbestos, 40; expressed oil almonds, 25; camphor, 1 part; oil peppermint, 5; perfume, 5.

Pink.—Zinc carbonate, 250 parts; bismuth subnitrate, 250; powdered asbestos, 250; expressed oil almonds, 100; camphor, 55; oil peppermint, 55; perfume, 25; eosin, 1 part.

Dark Red.—Like the preceding, but coloured with solution of carmine.

Black.—(1) Lampblack, 1 part; cacao butter, 6; oil neroli, sufficient. Melt the cacao butter and the lampblack, and while cooling make an intimate mixture, adding the perfume toward the last. (2) Lampblack, 1 part; expressed oil almonds, 1; oil of cocoanut, 1; perfume, sufficient. Beat the lampblack into a stiff paste with glycerin. Apply with a sponge; if necessary, mix a little water with it when using.

Tree Waxes. (*Chem. and Drugg.*, lviii. 445.) (1) Beeswax, 75; resin, 125; turpentine, 400; rape oil, 12; Venice turpentine, 25; zinc white, 25; turmeric, q.s.

(2) Japan wax, 1; beeswax, 3; resin, 8; turpentine, 4; paraffin, 1; mutton or beef suet, 3; pine resin, 6.

(3) Resin, 100; beeswax, 36; turpentine, 50; linseed oil, 12 lard, 6; turmeric, 2.

Universal Cleaning Liquid. The following, says the *Neueste Erfindungen und Erfahrungen*, will not attack even the most delicate colours, and may be used, without danger of injury, upon any fabric whatever: Oil of turpentine, rectified, 26 parts; alcohol, 157; sulphuric ether, 157; oil of lemon, 1 part.

Veterinary White Oils. (*Amer. Drugg.*, xxxvii. 339.) Eggs, 12; soft soap, 6 ozs.; oil of turpentine, 20 fl. ozs.; strong sol. of ammonia, 5 fl. ozs.; camphor, 6 ozs.; alcohol (methylated), 8 fl. ozs.; oil of origanum, 4 fl. ozs.; water, to 80 fl. ozs. Rub the soap with 10 fl. ozs. of soft water to a smooth jelly, and mix the eggs, previously beaten, with this. Next add the alcohol and camphor. Mix the turpentine and origanum and gradually add to the mixture, stirring briskly all the time with an egg beater. Then add the ammonia and finally water to 80 fl. ozs. To insure a good preparation this must be stirred constantly with an egg beater from start to finish.

Violet Essence. (*Pharm. Post*, xxxiii. 703.) Powdered Florentine orris, 100; dried violet flowers, 25; Siam benzoin, 25, are macerated for 8 days with alcohol (60 per cent.), 700; then strained, pressed and filtered. The essence thus obtained is a useful addition to toilet articles.

Violet Perfumes. (*Pharm. Zeit.*, xlvi. 305.) (1) Tincture of Florentine orris, 3,000, is taken, and from this 2,000 parts are distilled off on a water bath. To this distillate is added jasmin extract, 100; reseda extract, 100; cassia extract, 200; rose water, 200; spirit (95 per cent.), 300; ionone, 16; linalool, 10; orris oil, 2; essence of musk, 15; essence of civet, 2. Allow to stand 2 to 3 weeks, then filter. (2) Jasmine extract, 100; rose extract, 50; cassia extract, 50; geranium oil, 0·5; orris oil, 1; musk tincture, 12; vaniline, 0·3; ionone solution (1 : 10), 6; spirit, 772. Colour with chlorophyll tincture.

Warts on Children, Salicylic Acid in the Treatment of. (*Nat. Drugg.*, xxx. 93.) Salicylic acid has long been used as a remedy for corns, but its use as a remover of warts is not so general. Gauchier uses it in his clinic of the diseases of children almost entirely in the removal of the sometimes numerous and unsightly warts of childhood. He prefers it in the form of a pomade as follows: Salicylic acid, 1 part; mercuric-ammonium chloride, 5 parts; vaseline, 40. Mix. This is rubbed well into the parts affected every night on retiring. There are, of course, remedies much more rapid in action, but all of them present some grave drawback to their general employment. Pyrogallic acid ointment, for instance, which

is widely used for the same purpose, which is much more rapid in action, stains the garment, and is toxic besides, and has been the cause of many and severe accidents. Only in the rare cases where, from idiosyncrasy or other cause, salicylic acid fails, should other remedies be resorted to, and especially with infantile patients.

Writing on Glass. (*Pharm. Zeit.*, xlvi. 132.) Six years ago Marget, of Geneva, described a method for writing on glass by means of certain metals, such as zinc, cadmium, and particularly magnesium and aluminium. It is only necessary to fix a piece of aluminium, for example, in a crayon holder, and to make the necessary mark with this on the glass. The mark is very durable. It will not readily rub or wash off. It is advisable to previously moisten the glass with a few drops of sodium silicate solution.

TRANSACTIONS

OF THE

British Pharmaceutical Conference

AT THE

THIRTY-EIGHTH ANNUAL MEETING

IN

DUBLIN,

1901.

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British Pharmaceutical Conference.

CONSTITUTION.

Art. I.—This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following :—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.
2. The subscription shall be 7*s.* 6*d.* annually, which shall be due in advance upon July 1
3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.
4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.
5. The Officers of the Conference shall be a President, four Vice-presidents by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.
6. At each Conference it shall be determined at what place and time to hold that of the next year.
7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.
8. The Executive Committee shall present a report of proceedings annually.
9. These rules shall not be altered except at an annual meeting of the members.
10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

*** *Authors are specially requested to send the titles of their Papers to The Hon. Gen. Secs. Brit. Pharm. Conf.*, 17, *Bloomsbury Square, London, W.C., two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.*

FORM OF NOMINATION.

I Nominate

(Name) .....

Address) .....

as a Member of the British Pharmaceutical Conference.

.....*Member*

Date .....

This or any similar form must be filled up legibly, and forwarded to *The Asst. Secretary, Brit. Pharm. Conf.*, 17, Bloomsbury Square, London, W.C., who will obtain the necessary signature to the paper.

Pupils and Assistants, as well as Principals, are invited to become members.

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Tyson, John, Victoria Bridge, Manchester.

Umney, C., F.I.C., F.C.S., 48 & 50, Southwark Street, S.E.
Umney, E. A., 48 & 50, Southwark Street, S.E.
Umney, John C., F.C.S., 48 & 50, Southwark Street, S.E.
Unsworth, J. W., 113, George Street, Altrincham, Manchester.

Vallance, A. C., Fieldhead, Mansfield.

Vallet, C. E. Franklin, 1, Victoria Villas, High Road, Gunnersbury, W.
Vincent, P., 19, Jerdan Place, Fulham, S.W.
Voce, W. G., 52, Halesowen Road, Netherton, near Dudley.
Vogt, Geo., 30, Highgate, Kendal.

Wakeham, C., Helston, Cornwall.
Walker, Frank, 12, Beacon Lane, Everton, Liverpool.
Walker, James, 51, Hudson Street, Tyne Dock, South Shields.
Walker, James D., 5, Alvanley Terrace, Bruntsfield Links, Edinburgh.
Walker, John, 32, Virginia Street, Glasgow.
Walker, J. F., M.A., F.I.C., F.C.S., 45, Bootham, York.
Walmsley, G., 8, Surbiton Park Terrace, Kingston-on-Thames.
Walmsley, M., 225, Oxford Street, W.
Walsh, Dr. J. A., 30, Westmorland Street, Dublin.
Walton, R., 73, High Street, Maidenhead.
Wand, S., 18, Haymarket, Leicester.
Want, W. P., 42, Bishopsgate Street Without, E.C.
Ward, G., F.I.C., F.C.S., Millgarth Mills, Leeds.
Ward, J., 39, Eastgate Street, Gloucester.
Ward, J. S., 101, Whitecross Street, E.C.
Wardleworth, Theo. H., 56, Hanover Street, Liverpool.
Waring, A. W., 3, Bucklersbury, E.C.
Warren, W., 24, Russell Street, Covent Garden, W.C.
Warrick, F. W., 7, Portpool Lane, E.C.
Wathes, A., 6, Holloway Head, Birmingham.
Watkinson, J. W., 43, Higher Market Street, Farnworth, Bolton.
Watson, A. Forbes, 38, Westmorland Street, Dublin.
Watson, A. J., 110, Mill Lane, West Hampstead, N.W.
Watson, David, 41, Slnclair Drive, Langside, Glasgow.
Watson, F. P., F.C.S., 6, Bailgate, Lincoln.
Watson, J. E. H., Rose Corner, Norwich.
Watson, John, Rosemount, Knock, Belfast.
Watt, Geo. A., 20, Lynn Street, West Hartlepool.
Watts, J., 365, Tong Street, Dudley Hill, Bradford, Yorks.
Weary, C. T., 17, Trafalgar Place, Devenport.
Weaver, A. C., 42, Dudley Road, Wolverhampton.
Webb, E. A., Cookham Dene, Chislehurst, Kent.
Webb, J. H., Rowsley House, Cardiff Road, Luton, Beds.
Weddell, George, 20, West Grainger Street, Newcastle-on-Tyne.
Weld, C. Corning, Snow Hill Buildings, Holborn Viaduct, E.C.
Wellburn, John S., 60, Nightingale Road, Lower Clapton, E.
Wellcome, H. S., Snow Hill Buildings, Holborn Viaduct, E.C.
Wellings, Wm., 56, Hanover Street, Liverpool.
Wells, W. F., L.P.S.I., 20, Upper Baggot Street, Dublin.
Welton, Henry, junr., Bishop Street, Coventry.
West, T., 1187, Chester Road, Stretford, Manchester.
Weston, S. J., 151, Westbourne Terrace, W.
Whigham, R. L., 22, Brook Street, Bond Street, W.
White, Arthur F., 61, Sunbridge Road, Bradford, Yorks.
White, E., B.Sc., F.I.C., St. Thomas's Hospital, London, S.W.
White, G., 55, High Street, Dudley.
White, Thomas, 16, Fownes Street, Dublin.
Whitfield, J., F.C.S., 113, Westborough, Scarborough.
Whittle, J., 30, Bridge Street, Morpeth.
Whyte, J. S., 57, Guthrie Port, Arbroath, N.B.
Wiggins, H., 236, Southwark Park Road, S.E.
Wigginton, A., 137, Sloane Street, S.W.

Wild, John, 307, Oxford Street, Manchester.
Wild, Sydney, 76, Mill Street, Macclesfield.
Wild, T. J., 204, Peckham Rye, S.E.
Wilford, J., 52, Milton Street, Nottingham.
Wilkinson, B. J., 7, Middleton Road, Kingsland, N.E.
Willcock, F. A., 71, Victoria Street, Wolverhampton.
Will, W. Watson, F.C.S., 1, St. Agnes Place, Kennington Park, S.E.
Willan, R., 5, Market Street, Ulverston.
Williams, Jesse, Park Hall Buildings, Queen Street, Cardiff.
Williams, J. H., 35, Commercial Road, Bournemouth.
Williams, W. G., 8, Castle Street, Conway.
Williamson, F. A., Moor Park Pharmacy, Preston, Lancs.
Williamson, L., 12, Haldane Terrace, West Jesmond, Newcastle-on-Tyne.
Williamson, W. H., 54, Dantzic Street, Manchester.
Wills, G. S. V., Westminster College, Trinity Square, Boro', S.E.
Wilson, H., F.I.C., 146, High Street, Southampton.
Wilson, Harold, University College Hospital, Gower Street, W.C.
Wilson, J., 11, George Street, Bath.
Wilson, J. H., J.P., The Knowle, Harrogate.
Wing, G. N., 29, Market Place, Melton Mowbray.
Wink, J. A., 2, Devonshire Square, Bishopsgate Street, E.C.
Winterton, Frank N., 23, Bevis Marks, E.C.
Wokes, T. S., Grassendale, near Liverpool.
Wood, A., Brentford, Middlesex.
Wood, Wm., 24, Tower Road, Dartford, Kent.
Wooddisse, Frank B., Kenilworth.
Woodhead, S. A., The College, Uckfield, Sussex.
Woods, W. H., 50, Bedford Street, Plymouth.
Woodward, M. Mellor, 53, London Road, Reigate.
Woollcombe, Dr. Robert Lloyd, M.A., LL.D. (Dublin Univ.), LL.D. (Royal Univ.), F.I.Inst., F.S.S., M.R.I.A., F.R.S.A. (Ireland), Medical Student (T.C.D.), Barrister-at-Law, 14, Waterloo Road, Dublin.
Woolley, E. J., Victoria Bridge, Manchester.
Woolley, G. J. B., London Road, Leicester.
Woolley, G. S., Victoria Bridge, Manchester.
Woolley, Hermann, Victoria Bridge, Manchester.
Woolley, S. W., 91, Southwood Lane, Highgate, N.
Woollons, C. H. F., 28, Kilburn Lane, W.
Wootton, A. C., Barrymore, Fallow Corner, North Finchley, N.
Wootton, H., B.Sc., 323, Clapham Road, S.W.
Worfolk, G. W., 16, Brook Street, Ilkley.
Worrall, J. H., F.I.C., F.C.S., Howsley, Chapeltown, nr. Sheffield.
Worsley, A. G., 135, Ladbroke Grove, W.
Wrenn, W. A., F.C.S., 15, East Street, Taunton.
Wright, A., A.K.C., 13, High Street, Yeovil, Somerset.
Wright, G., 102, High Street, Burton-on-Trent.
Wright, H. C., 48 & 50, Southwark Street, S.E.
Wright, R., F.C.S., 11, Eagle Parade, Buxton, Derbyshire.
Wyatt, H., 223, Stanley Road, Bootle, Liverpool.
Wyborn, J. M., F.C.S., 59, Moorgate Street, E.C.
Wyley, W. F., Wheatley Street, Coventry.
Wyman, J. S., 58, Bunhill Row, E.C.
Wynne, E. P., 7, Pier Street, Aberystwith.

Yates, C. G., 9, Upper Hamilton Road, Brighton.
Yates, D., 32, Darwen Street, Blackburn.
Yates, F., "Aysgark," Avenue Elmers, Surbiton.

Yates, R., "Gatewick," The Avenue, Beckenham, Kent.
Young, J. Rymer, F.C.S., 40, Sankey Street, Warrington.
Young, J. R., 38, Chalmers Street, Lauriston, Edinburgh.
Young, J. R., junr., 2, Grange Road, Edinburgh.
Young, Pelham C., 229, High Road, Kilburn, N.W.
Young, R. F., New Barnet.

NOTICE.

Members are requested to report any inaccuracies in these lists by letter, addressed as follows :—

THE ASST. SECRETARY,
BRIT. PHARM. CONF.,
17, *Bloomsbury Square,*
London, W.C.

SOCIETIES AND ASSOCIATIONS

INVITED TO SEND DELEGATES TO THE ANNUAL MEETING.

The Pharmaceutical Society of Great Britain.
The North British Branch of the Pharmaceutical Society of Great Britain.
The Pharmaceutical Society of Ireland.

ABERDEEN.—Pharmaceutical Association. John Cruickshank, 42, George Street, Aberdeen.

BELFAST.—Chemists and Druggists' Society of Ireland (North Branch). W. J. Rankin, 10, Garfield Chambers, Belfast.

BIRMINGHAM.—Midland Pharmaceutical Association. G. H. Brunt, 323, Coventry Road, Birmingham.

BOURNEMOUTH.—Pharmaceutical Association. F. E. Bilson, 1, Lansdowne Crescent, Bournemouth.

BRIGHTON.—Association of Pharmacy (1861). W. W. Savage, 109, St. James's Street, Brighton.

BRISTOL.—Pharmaceutical Association (re-established 1869). B. Keen, 90, Park Street, Bristol.

CAMBRIDGE.—Pharmaceutical Association. B. S. Campkin, Mill Road, Cambridge.

COLCHESTER.—Association of Chemists and Druggists (1845). Edes Everett, St. Botolph Pharmacy, Colchester.

DOVER.—Chemists' Association. R. M. Ewell, 37, Town Wall Street, Dover.

EDINBURGH.—Chemists' Assistants and Apprentices' Association. Peter K. Brown, 64, Tolbooth Wynd, Leith.

FORFARSHIRE AND DISTRICT.—Chemists' Association. Wm. Cummings, 49, Reform Street, Dundee.

GLASGOW AND WEST OF SCOTLAND.—Pharmaceutical Association. D. Watson, 558, Cathcart Road, Glasgow.

HULL.—Chemists' Association (1868). C. B. Bell, 6, Spring Bank, Hull.

LANCASHIRE (NORTH-EAST).—Chemists' Association. Joseph Hindle, 165, Walter Street, Blackburn.

LEEDS.—Chemists' Association (1862). W. D. Pollitt, Church Institute, or 106, Woodhouse Lane, Leeds.

LIVERPOOL.—Chemists' Association (1849). Theo. H. Wardleworth, 56, Hanover Street, and Hugh O. Dutton, Rockferry, Liverpool.

LONDON.—Chemists' Assistants' Association. R. E. Lownsbrough, 73, Newman Street, W. Western Chemists' Association. W. J. J. Philp, 34, High Street, Notting Hill, W.

MANCHESTER.—Pharmaceutical Association. Jas. C. Kidd, 551, Cheetham Hill Road, Manchester.

NEWCASTLE-ON-TYNE.—Newcastle-on-Tyne and District Chemists' Association. W. Atkins, 126, Raby Street, So. Byker, Newcastle-on-Tyne.

NOTTINGHAM.—Nottingham and Notts Chemists' Association (1863). A. Eberlin, 2, Chapel Bar, Nottingham.

OXFORD AND DISTRICT.—Chemists' Association. John Dolbear, 108, High Street, Oxford.

PLYMOUTH, DEVONPORT, STONEHOUSE AND DISTRICT.—Chemists' Association. G. Fairweather, 11, Laird Terrace, Plymouth.

SHEFFIELD.—Pharmaceutical and Chemical Society (1869). H. Antcliffe, Union Offices, Sheffield.

SUNDERLAND.—Chemists' Association (1869). A. W. Golightly, 14, Hendon Valley Road, Sunderland.

SWANSEA.—Swansea and District Chemists' Association. John Davies, 75, Oxford Street, Swansea.

PRESENTATION COPIES OF THE YEAR-BOOK OF PHARMACY ARE FORWARDED TO THE FOLLOWING:—

The Honorary Members.

Libraries.

American Pharmaceutical Association; Chemical Society of London; École Supérieure de Pharmacie, Montpellier; École Supérieure de Pharmacie, Paris; The Mason College, Birmingham; New Zealand Board of Pharmacy; North British Branch of the Pharmaceutical Society; Pharmaceutical Society of Great Britain; Pharmaceutical Society of Ireland; Pharmaceutical Society of New South Wales; Ontario College of Pharmacy, Toronto; Pharmaceutical Society of Australasia; Pharmaceutical Society of Queensland; Philadelphia College of Pharmacy; Royal Society of London; Société de Pharmacie, Paris; Yorkshire College of Science, Leeds; Owens College, Manchester; The Pharmaceutical Society of Cape Colony.

Provincial Associations (having Libraries).

Bristol Pharmaceutical Association; Dover Chemists' Association; Forfarshire and District Chemists' Association; Glasgow and West of Scotland Pharmaceutical Association; Leeds Chemists' Association; Liverpool Chemists' Association; London Chemists' Assistants' Association; Manchester Chemists and Druggists' Association; Midland Pharmaceutical Association; Nottingham and Notts Chemists' Association; Sheffield Pharmaceutical and Chemical Association; Sunderland Chemists' Association.

Journals.

American Journal of Pharmacy; Archiv der Pharmazie; British and Colonial Druggist; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie et de Chimie; Pharmaceutical Journal; Répertoire de Pharmacie.

THE FOLLOWING PUBLICATIONS ARE RECEIVED FROM THEIR RESPECTIVE EDITORS:—

American Journal of Pharmacy; Annales de Chimie Analytique; Archiv der Pharmazie; Australasian Journal of Pharmacy; British and Colonial Druggist; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie et de Chimie; Meyer Bros.' Druggist; National Druggist; Pharmaceutical Journal; Proceedings of the American Pharmaceutical Association; Répertoire de Pharmacie; L'Union Pharmaceutique; Oesterreich. Apotheker-Vereines.

PROGRAMME OF THE PROCEEDINGS

OF THE

BRITISH PHARMACEUTICAL CONFERENCE

AT THE

THIRTY-EIGHTH ANNUAL MEETING, DUBLIN, 1901.

OFFICERS.

President. G. C. DRUCE, M.A., F.L.S., Oxford.

Vice-Presidents.

(Who have filled the office of President.)

THOMAS B. GROVES, F.C.S., Weymouth.
PROFESSOR ATTFIELD, Ph.D., F.R.S., F.I.C., F.C.S., Watford.
S. R. ATKINS, J.P., Salisbury.
F. B. BENGER, F.I.C., F.C.S., Manchester.
C. UMNEY, F.I.C., F.C.S., London.
W. MARTINDALE, F.C.S., F.L.S., London.
OCTAVIUS CORDER, Norwich.
N. H. MARTIN, F.L.S., Newcastle-on-Tyne.
C. SYMES, Ph.D., F.C.S., Liverpool.
J. C. C. PAYNE, J.P., M.P.S.I., Belfast.
E. M. HOLMES, F.L.S., London.

Vice-Presidents.

G. T. W. NEWSHOLME, F.C.S., Sheffield.
G. D. BEGGS, M.P.S.I., Dalkey.
PETER BOA, Edinburgh.
Professor TICHBORNE, Ph.D., Dublin.

Treasurer.

JOHN C. UMNEY, F.C.S., London.

Honorary General Secretaries.

W. A. H. NAYLOR, F.I.C., F.C.S., London.
F. RANSOM, F.C.S., Hitchin.

Honorary Local Secretary.

J. I. BERNARD, Dublin.

Assistant Secretary.

JOHN HEARN.

Other Members of the Executive Committee.

ATKINSON, LEO., London.
BIRD, F. C. J., London.
COLLIER, H., London.
FARR, E. H, F.C.S., Uckfield.
GREENISH, Prof., F.I.C., F.L.S., London.
KELLY, PATRICK, Dublin.
PECK, E. SAVILLE, M.A., Cambridge.
WARREN, W., London.
WHITE, EDMUND, B.Sc., London.

Auditors.

J. H. MATHEWS, London, and G. H. GRINDLEY, Dublin.

Editor of the Year-Book.

J. O. BRAITHWAITE.

Dublin Local Committee.

*ALLEN, W. N., Dublin.
*ASHE, J. S., *Assistant Hon. Sec.*, Dublin
AUCHINLECK, Dr. (Apothecaries' Hall), Dublin.
*BATT, T., Sandymount.
BAXTER, W. J., Coleraine.
*BEGGS, G. D., *Hon. Treasurer*, Dublin.
BELL, S. (Butler's Medical Hall), Dublin.
*BERNARD, J. I., *Local Hon. Sec.*, Dublin.
BLAIR, R., Cork.
BOARDMAN, J. H., Inchcore.
BOWERS, M., Dublin.
BOWDEN, J. H., Dublin.
*BOYD, S. P., *Vice-Chairman*, Dublin.
BOYERS, H. T., Sligo.
BRADY, T. H. R., Dublin.
BRITTAIN, T. W., Drogheda.
*BROWN, G., Dublin.
CAHILL, A. J., Dublin.
COCHRANE, SIR H., Dublin.
CONNOR, E., Newry.
*CONYNGHAM, H., Dublin.
CONYNGHAM, W. B., Dublin.
CORRIGAN, W., Celbridge.
CRINION, D., Dublin.
CURRY, J. S., Boris.
DIAMOND, G., Maryborough.
DUNWOODY, W. J., Ballybay.
*ENGLISH, T. J., Rathgar.
EVANS, C., Dublin.
EVANS, J., Dublin.
FIELDING, P. J. D., Cork.
FITZPATRICK, M., Dublin.
GARDINER, J. A., Dublin.
*GILL, F., Dublin.
GILMORE, G., Kilkenny.
*GOLDON, H. V., Birr.
GORDON, J., Dublin.
GREENFIELD, W., Dublin.
*GRIMES, H. C., Dublin.
*GRINDLEY, G. H., Dublin.
HARDY, J. N., Dublin.
HARRINGTON, S., Cork.
HARVEY, W. C., Dublin.
HODGSON, SIR E. M., Dublin.
HUNT, H., Dublin.
JOHNSTON, C. J., Carlow.
*JOHNSTON, H. V., Ranelagh.
JONES, W., Dublin.
KILOH, J., Cork.
*KELLY, P., Dublin.
LAIRD, W., Dublin.
LESTER, T. R., Cork.
MAXWELL, W. A., Dalkey.
MERRIN, DR., Dublin.
MEYRICK, H. C., Drogheda.
MICHIE, J., Blackrock.
*MIDDLETON, J. R., Dublin.
MISSTEAR, H. S., Dublin.
M'HUGH, J. J., Athy.
*M'WALTER, J. C., Dublin.
MURPHY, J., Cork.
O'FARRELL, J. C., Dublin.
O'CONNOR, H., Dublin.
O'NEILL, J. F., Carrick-on-Suir.
O'SULLIVAN, D., Dublin.
O'SULLIVAN, J. J., Waterford.
O'SULLIVAN, T., Waterford.
PAIN, R., Dublin.
PATTERSON, A, J., Dublin.
*PEACOCKE, P. A. V., Dublin.
PORTER, W. D., Dublin.
PRICE, C. E., Athy.
RAY, J. A., Jun., Dublin.
RICE, DR., Portarlington.
*ROBINSON, SIR T., Dublin.
*SIMPSON, R., Dublin.
SMALLMAN, I., Dublin.
*SMITH, J., Terenure.
STEWART, J., Limerick.
STRONGETHARM, D., Kingstown.
*TICHBORNE, PROFESSOR, Dublin.
TYRIE, A., Dublin.
VANCE, C. B., Greystones.
WALDRON, M. M., Ballybaunis.
*WALSH, J. A., Dublin.
WELLS, A. O., Dublin.
*WELLS, W. F., *Chairman*, Dublin.
WHELAN, J. M., Galway.
WHITE, P. N., Sligo.
WHITE, T., Dublin.
WHITE, T., Queenstown.
WHITLA, DR. M. R., Monaghan.
WOODSIDE, J. A., Ballymena.
WOOLLCOMBE, R. L, LL.D., Dublin.

Those marked with an asterisk were on the Local Executive.

THE SITTINGS OF THE CONFERENCE WERE HELD IN

THE LECTURE THEATRE OF THE ROYAL DUBLIN SOCIETY,

ON TUESDAY & WEDNESDAY, JULY 30TH AND 31ST, 1901,

Commencing at Ten a.m. each day.

MONDAY, 29th JULY.

The EXECUTIVE COMMITTEE met, according to notice from the Honorary General Secretaries, at the Shelbourne Hotel, Dublin.

TUESDAY, 30th JULY.

The CONFERENCE met at 10 a.m., adjourning at 1 p.m.; and at 2 p.m., adjourning at 4 p.m.

Order of Business.

Address of Welcome by the Chairman of the Dublin Committee, W. F. Wells, Esq., supported by Richard J. Moss, Esq., on behalf of the Royal Society, and G. D. Beggs, Esq., President of the Pharmaceutical Society of Ireland.

President's Address.

Reception of Delegates.

Report of Executive Committee.

Financial Statement.

Report of Treasurer of the "Bell and Hills Library Fund."

Report of Formulary Committee, by N. H. Martin, F.L.S., F.C.S.

Reading of Papers and Discussions thereon.

PAPERS.

1. *The Pharmacopœial Requirements of Jalap*, by John C. Umney, F.C.S.
2. *The Official Estimation of Liquor Hydrogenii Peroxidi*, by W. A. H. Naylor, F.I.C., and C. S. Dyer.
3. *Concerning Cascara Sagrada*, by Bridget Rose Clinton.
4. *The Chemistry of the Bark of Robinia Pseudacacia Linné*, by F. B. Power, Ph.D.
5. *The Anatomy of the Bark of Robinia Pseudacacia Linné*, by Pierre Elie Félix Perrédès, B.Sc., F.L.S.
6. *Chemical Standardisation of Galenical Preparations*, by N. H. Martin, F.C.S., F.L.S.
7. *The Standardisation of Galenicals*, by H. Wippell Gadd.

There was a mid-day adjournment between 1 and 2 p.m. for luncheon at the Mansion House.

WEDNESDAY, 31st JULY.

The CONFERENCE met at 10 a.m., adjourning from 1 to 2 p.m. The whole of the business was completed at 5 p.m.

Order of Business.

Reading of Papers and Discussions thereon.

PAPERS.

8. *The Estimation of Phenol*, by JOHN C. THRESH, D.Sc., M.D.
9. *Laboratory Notes*, by T. TYRER, F.I.C., F.C.S., and C. T. TYRER, F.C.S.
   (1) Distillation and Boiling Points.
   (2) Comparison of the quantitative action of reducing agents on Mercury and Bismuth Salts.
   (3) Effect of glassware containers on Acids.
10. *Hydrastin*, by THOS. MABEN.
11. *The Preparations of Ergot*, by J. C. MCWALTER, B.A., D.P.H., F.F.P.S.
12. *Liquor Calumbæ Conc., B.P.*, by F. C. J. BIRD.
13. *Note on Liquor Gentianæ Compositus Concentratus*, by E. H. FARR, F.C.S., and R. WRIGHT, F.C.S.
14. *Two Years' Analytical Experience of the Poor Laws Drug Supply*, by CHAS. R. C. TICHBORNE, F.I.C., Dip. in P.H., R.C.S.
15. *The Cause of the Loss of Strength of Spiritus Aetheris Nitrosi*, by E. H. FARR, F.C.S., and R. WRIGHT, F.C.S.
16. *The Presence of Arsenic in Ferrum Redactum and its Approximate Determination*, by E. SAVILLE PECK, M.A.
17. *A Soluble Manganese Citrate and some Compounds of Manganese with Iron*, by F. B. POWER, Ph.D.
18. *The Chemical Character of so-called Iodo-tannin Compounds*, by F. B. POWER, Ph.D., and F. SHEDDEN, B.Sc., A.I.C.
19. *Additional Notes on Cardamom Fruits*, by R. C. COWLEY and J. P. CATFORD.
20. *Hydrobromic Acid*, by E. M. MARSHALL.
21. *An Improvement on the B.P. Santonin Test*, by PERCY PAIN, Ph. Ch.
22. *On Uniformity in Dispensing*, by A. L. DORAN, M.P.S.I.

Presentation from the "Bell and Hills" Fund.
Election of Formulary Committee.
Place of Meeting for 1902.
Election of Officers for 1901–1902.

There was a mid-day adjournment between 1 and 2 p.m. for luncheon at the Mansion House.

THURSDAY, 1st AUGUST.

Excursion to Glendalough. For particulars see page 495.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING IN DUBLIN, 1901.

THE Thirty-eighth Annual Meeting of the British Pharmaceutical Conference commenced its sittings on Tuesday, July 30th, in the Lecture Theatre of the Royal Dublin Society, and after luncheon continued and completed its sittings in the same Theatre under the chairmanship of Geo. Claridge Druce, Esq., M.A., F.L.S., Oxford.

The following members and friends were present during the meeting :—

Aberdeen—Johnston, J.; Kay, J. P.

Ann Arbor, U.S.A.—Prescott, Professor A. B.

Arbroath—Naysmith, A., Mr. and Mrs.

Assam, India—Moore, Wm.

Atherston—Parkinson, F. W.; Stafford, R.

Bandon—Wyatt, W. J.

Bath—Collis, A. F.

Bedlington—Foggan, Geo.

Belfast—Burkey, J. C.; Gibson, W. J., and Miss Gibson; Guiler, J.; Hardy, W. J.; Moffitt, T. N.; Nicholl, J. W.; Payne, J. C. C., Mr. and Mrs.; Thompson, S. J.

Birmingham—Poole, J.; Thompson, C., Mr. and Mrs.

Birr—Soldon, H. V.; Regan, Dr. J. W.

Blackburn—Yates, J. G.; Yates, J.

Bootle—Swinton, E.; Swinton, T. H.

Bradford—Hanson, A.; Silson, R. W., Mr. and Mrs.

Bristol Chandler, J.; Palhick, J., and Mrs. Palhick; Griffiths, Dr. and Mrs.

Calcutta—Baker, C. T.

Cambridge—Church, E. H.; Peck, E. S.

Carlisle—Hallaway, J., Mr. and Mrs.

Clifton—Buxton, T., Mr. and Mrs.

Craven Arms—Poole, T.

Cork—Fielding, P. J. D.

Dalkey—Beggs, G. D., Mr. and Mrs.

Dowlais—Rees, R. P.

Drogheda—Meyrick, H. C.

Dublin—Allen, E., and W. N.; Armstrong, P.; Ashe, J. S.; Bernard, J. I.; Boyd, J. B.; Boyd, S. P.; Brown, George; Brunker, J. E.; Campbell, H. F., Mr. and Mrs.; Clinton, Miss Bridget R.; Conyngham, Henry, Mr. and Mrs.; Conyngham, W.; Doran, A. L.; Doran, Miss Teresa; English, Bessie M.; English, T. J.; Evans, C.; Gill, F. J.; Grimes, H. C.; Grindley, G. H.; Grindley, R. G.; Hardy, J. N.; Hunt, H.; Johnston, L. B.; Johnston, W. Vincent; Jones, W.; Kelly, P., Mr. and Mrs.; Kelly, S.; Kyle, Miss. M. A.; McKnight, R. W.; McWalter, Geo.; McWalter, Dr. J. C.; Montgomery, R.; O'Dwyer, R. J.; Simpson, R.; Smith, John; Tichborne, Dr. C. R. C.; Walsh, Dr. J. A., and Mrs. Walsh; Watson, D. M.; Wells, W. F., Mr. and Mrs.; Wells, Misses F. I. and J. T.; White, T.; Woollcombe, Dr. R. Lloyd.

Dundee—Anderson, Jno., Mr. and Mrs.; Anderson, A. B., Mr. and Mrs.; Cummings, W.; Cummings, Miss; Kerr, C.; Ramsay, E.; Ramsay, Wm. C.; Russell, James.

Edinburgh—Bayne, Thos.; Care, H. B.; Cowie, W. B.; Gibson, Adam; Gibson, Miss; Henry, Claude F.; Hill, J. R.; Mair, W.

Exeter—Gadd, Henry; Lake, J. H., and Miss H.; Luxton, Fred.; Milton, T. C., Mr. and Mrs.; Vinden, H. J.

Glasgow—Brodie, R.; Currie, W. L., Mr. and Mrs.; Irvine, Mr. and Mrs.; Kilpatrick, D. R., jun., Mr. and Mrs.; Maben, Thos.; McMillan, J., Mr. and Mrs.; Reid, Miss; Robertson, G., Mr. and Mrs.

Gravesend—Clarke, R. F., Mr. and Mrs.

Guelph, Canada—Hill, Alexander.

Hereford—Jackson, J. J.

Hitchin—Ashton, J. W.; Ransom, F., Mr. and Mrs.

Johannesburg—Ingram, F., Mr. and Mrs.

Kingston—Robinson, Sir. T. W., and Lady Robinson; Strongitharm, W. G.

Leeds—Mills, A.

Liverpool—Abraham, T. F., Mr. and Mrs.; Alexander, A.; Alexander, John; Cowley, R. C., Mr. and Mrs.; Evans, Edw., jun.; Evans, J. H. E.; Evans, Kenneth; Symes, Dr. C., and Mrs.; Wardleworth, T. H.

London—Bird, F. C. J.; Bourdas, I.; Bourdas, Miss; Brewis, E. T.; Bowen, J. W.; Bremridge, R.; Cooper, A.; Cooper, Miss; Conyngham, W. B.; Cresswell, F.; Everson, Mr. and Mrs.; Hearn, J.; Howie, W. L.; MacEwan, P.; Naylor, W. A. H.; Pettinger, E.; Power, Dr. F. B.; Robinson, R. A.; Robinson, W. Prior;

Sangster, A.; Taylor, G. S.; Tyrer, Thos.; Umney, J. C.; Want, W. P.; Weld, C. C.; Weston, S. J.; White, Edmund; Wright, A. H., Mr. and Mrs.

Louth—Simpson, H. D.

Manchester—Johnstone, C. A., and the Misses Johnstone; Kemp, H., Mr. and Mrs.; Lawton, A., Mr. and Mrs.; Lawton, Miss C.; Pidd, A. J., and Miss M. E. Pidd; Stockwell, Miss; Wild, John, Mr. and Mrs.

Merthyr Tydvil—Harris, E. W.

Newry—Connor, J. E.

Newcastle-on-Tyne—Martin, N. H., Mr. and Mrs., and Miss Martin.

Oxford—Druce, G. Claridge; Leach, T. H.

Plymouth—Barge, J.

Rathgar—Lenchan, J. J.

Shipley (Leeds)—Bayley, Mr. and Mrs.

Sidcup—Hanson, A. W., Mr. and Mrs.

Sligo—Boyers, H.

Stockton-on-Tees—Clarke, W. J.

Swansea—Davies, J. T.; Hughes, Jas.

Tunbridge Wells—Hobbs, A. E., Mr. and Mrs.

Watford—Attfield, Dr. John.

Wigan—Phillips, Jno., Mr. and Mrs.

Wolverhampton—Gibson, F. J., Mr. and Mrs.

Worcester—Twinberrow, J.

Meeting of the Executive Committee.

A meeting of the Executive Committee was held at the Shelbourne Hotel, Dublin, on Monday, July 29th, at 5.30 p.m.

Present:—Mr. G. Claridge Druce (President), Dr. Attfield, Messrs. Beggs, Martin, Payne, Dr. Symes, and Dr. Tichborne (Vice-Presidents), Mr. J. C. Umney (Treasurer), Messrs. Bird, Kelly, Peck, and White, Mr. Naylor and Mr. Ransom (Hon. Gen. Secs.), and Mr. J. Hearn (Asst. Secretary).

The minutes of the previous meeting were read and confirmed.

Mr. Umney read the financial statement for 1900–1, and congratulated the Committee on the improved financial position of the Conference. He stated that the receipts for subscriptions were £36 more than the previous year, and hoped, with the reduced expenditure, to have a balance on the right side at the end of the current year. The statement was adopted for presentation to the Annual Meeting.

Mr. Naylor submitted the programme for the Annual Meeting, containing twenty-two papers for discussion. It was unanimously approved. He also stated that an invitation for the Conference to Dundee for 1902 would be offered at the Meeting by Mr. Kerr.

Mr. Ransom read the draft report of the Executive Committee, which was accepted for presentation to the Annual Meeting.

Mr. Naylor having left the meeting, the subject of his resignation was discussed. The President, Dr. Attfield, and other members of the Committee having spoken very highly of the services rendered to the Conference by Mr. Naylor—who had held the post of secretary for thirteen years, longer than any former occupant, Dr. Attfield alone excepted—it was resolved on the motion of Dr. Attfield, seconded by Mr. Martin, that a sub-Committee be appointed to arrange for a testimonial to be given to him. The following gentlemen were elected to serve on this sub-Committee: The President, Dr. Attfield, Messrs. Atkins, Martin, Peck, Ransom, J. C. Umney, and White—Mr. J. C. Umney to act as Treasurer.

The list of officers for the coming year, as submitted at the last meeting of the Committee, was then adopted for presentation to the Annual Meeting, with the substitution of the name of Mr. Naylor for Mr. Boa as a Vice-President, and the addition of the names of Mr. Cummings, of Arbroath, as Local Secretary for the 1902 Meeting, and of Mr. E. Saville Peck, M.A., of Cambridge, as junior Hon. Gen. Secretary.

Mr. Martin made some observations relative to the question of reduced fares, and a suggestion for approaching the railway companies next year, which will be duly considered by the Secretaries.

The following nineteen gentlemen, having been proposed for membership were duly elected:—

Allen, W. N., Dublin.
Bayne, Thos., Edinburgh.
Burkey, J. C., Belfast.
Boyd, S. P., Dublin.
Bowden, J. H., Dublin.
Clarke, R. F., Gravesend.
Cocking, J. J., Prahran, Victoria.
Evans, Kenneth W., Liverpool.
Ferrall, A. J., Dublin.
Gwatkin, J. R., Brighton.
Grimes, H. C., Dublin.
Heslop, C. W. B., London.
Jackson, J. J., Hereford.
John, W. D., Cardiff.
Johnston, V., Dublin.
Moore, W., Dibrugahr, Upper Assam.
Pain, Percy, Cambridge.
Tanner, J. B. H., Nathalia, Victoria.
Watson, A. F., Dublin.

GENERAL MEETING.

Tuesday, July 30th.

The Thirty-eighth Annual Meeting of the Conference commenced its sittings on Tuesday, July 30th, in the handsome and commodious theatre of the Royal Dublin Society, the chair being taken by the PRESIDENT, Mr. G. C. Druce, M.A., F.L.S., Mayor of Oxford, at 10 o'clock. The Lord Mayor of Dublin was expected to have attended to welcome the Conference, but was unfortunately detained in London by parliamentary business.

Mr. W. F. WELLS, Chairman of the Dublin Committee, therefore said it was his privilege, on the second visit of the Conference to Dublin, to offer a most hearty welcome; that welcome would, however, he felt sure, be evinced not in words but in a practical way. They would endeavour to make all their friends enjoy to the utmost their visit to the capital of Ireland and the second city of the empire. There had been some discussion on previous occasions on this question of civic eminence, and at Glasgow and Liverpool he had thought it as well not to take part in the argument, but on the present occasion he had not the slightest hesitation in asserting that Dublin was the second city of the British Empire. It was felt by many that there was not such a close unity between British and Irish pharmacists as there might be, and much was done at the previous meeting to cement the feeling of harmony which ought to exist, but he hoped the union would be even more strongly and deeply felt and manifested at the present Conference. Having referred to the intention of the Lord Mayor of Dublin to attend the Conversazione and welcome the Conference that morning, and explained that important public business necessitated his presence in London, Mr. Wells expressed the thanks of the Local Committee to his lordship for his great kindness in placing the Mansion House at their disposal for the purpose of the mid-day luncheon, a privilege which all members and visitors would soon be in a position to appreciate. He would like to assure the President how pleased all Irish pharmacists were to see him in that honourable position. He was not only a great scientific man, but a working pharmacist; he combined in himself qualifications not often seen together—great learning and great geniality; so that he was inclined to think that he must have some Irish blood in his veins. He concluded by giving a hearty welcome to the lady visitors, who would find that every possible arrangement for their comfort and pleasure had been made by the Ladies' Committee.

Mr. RICHARD J. MOSS, F.I.C., F.C.S., on behalf of the Royal Dublin Society, offered the Conference a hearty welcome to the Society's rooms.

Mr. G. D. BEGGS (President of the Pharmaceutical Society of Ireland) also welcomed the members of the Conference to Dublin. He would not detain them by extolling the beauties of the city, but would leave the visitors to find those out for themselves. He had had the honour and pleasure of giving the invitation in London, when he promised many things, and he would do his part in seeing that those promises were fulfilled. The Local Committee had done its best to make this year's Conference a success.

PRESIDENTIAL ADDRESS.

The PRESIDENT said they all knew the difficulties that a local Committee had to contend with in making the meetings a success, and the hearty way in which the present Committee had gone to work would be thoroughly appreciated. They had had a taste of Irish welcome before, and would look forward to another before twenty years had passed. He then proceeded to deliver his address.

Twenty-three years have rolled by since this Conference met in the capital city of the Emerald Isle and enjoyed the proverbial hospitality of its generous and warm-hearted people. The chair which, by your great kindness, I occupy to-day was then filled by an eminent pharmacist, Mr. George Frederick Schacht, whose unwearied efforts in the cause of pharmaceutical education deserve our unstinted praise and gratitude. He is one whose memory we, Conference members especially, hold in high esteem, since this Conference is to a great extent an offspring of his own, as in 1852 he suggested the advisability of founding a peripatetic annual meeting for the discussion of scientific objects connected with pharmacy, and although the scheme was not then adopted, yet shortly after, in a modified form, it was established, and the first meeting was held in 1863 at Newcastle-on-Tyne, under the presidency of Henry Deane, of Clapham.

At Dublin, as you are aware, Mr. Schacht gave an interesting sketch of the business life of a pharmacist, in which the work during a four years' apprenticeship and the period devoted to scientific study as an assistant in an historic pharmacy, prior to entering upon a business career, were described. The special point insisted

upon in the address was that the ideal pharmacist must be impressed with a high sense of the duty of his calling, and that this calling is to be looked upon rather as a trust than a personal possession. Gentlemen, after twenty-three years' experience, can we venture to assert that proposition, or have we to modify that definition to-day? Can we say that we are nearer to the ideal, or are we obliged to admit that in many ways, from varying causes, our ideal has lost the clear, sharp outline, and that at the beginning of the twentieth century the image of perfection has become blurred and indistinct, which in the preceding century we hoped was being brought into a sharp focus? If so, can we recast the die and use the graver's tool once again to make the impression sharp and true? Let me draw your attention for a few moments to the condition of the Conference then and now. Of the officers who were here twenty-three years ago we have lost our President, and of the five Vice-Presidents who had filled the chair only one to-day survives—Thomas B. Groves, who has been a most hearty supporter of the Conference, and who by his scientific work has done much to raise the standard of our calling. But we have lost the genial Bentley, who for so many years did so much to advance the knowledge of botany among pharmacists, and whose *Manual* was written on such excellent lines, and who in his address at the Nottingham meeting in 1866 put very strongly before pharmacists the claims that botany has for a place in our course of study; Stoddart, of Bristol, whose facile pen explained the botanical and geological features of his charming district, and who in many ways might be taken as the type of the ideal which his fellow-townsman sketched in the address given in this city; Henry Brady, a man of more specialized knowledge, whose researches on foraminifera, especially those printed in the report of the *Challenger* expedition, made him well worthy of the blue ribbon of scientific distinction in being admitted a Fellow of the Royal Society; and last, but by no means least, Redwood, the Professor of Pharmacy, gave distinction and position to the art we follow, and has left his place unfilled, while his subject occupies, most unfortunately, a less conspicuous place to-day in our curriculum of study.

The financial statement of the Conference read in 1878 showed that £757 was received in the year, equal to a membership of over 2,000, with which our present list, after nearly a quarter of a century's system of compulsory pharmaceutical examination, bears a very unfavourable comparison. What is the cause? Has the compulsory system of examination resulted in a dead level of un-

interesting and unintellectual mediocrity? Has the toil and stress of business occupation been so much increased as to numb the higher faculties and to enervate the desire to become proficient in scientific attainments? Or has the upas tree of company trading, which has assumed such enormous and overshadowing and unhealthy proportions, been the factor which has exerted this malevolent influence, and in many instances converted one who would have been an intelligent and independent pharmacist into a mere qualifying dummy, not more interested in the use and properties of the medicaments he is supposed to control the sale of than a penny-in-the-slot automaton?

For the present I will attempt to give no reason for this falling-off in the numbers of our membership-roll, but I will make a strong appeal to my brother pharmacists in this vast empire to support us, since we know that the work this Conference has done in furthering scientific pharmacy has been very great, that in the long series of "Year-Books" which have been published under its direction, the epitome of work of the year has been presented, and the result of much really good and scientific advancement in our knowledge of pharmacy has been presented to the members. The Committee believe that by bringing the *Year-Book* more fully up to modern requirements it may be made a necessary and desirable adjunct to every pharmacy.

This Conference does not discuss politics, even of a pharmaceutical character, so that every pharmacist in the empire may join its roll without compromising any opinion or subscribing to any article. I trust this Dublin meeting may see a large accession to our ranks.

In all ages of history the followers of our business have been noted for narrow means, while the occupation has, perhaps, more than any other, been of a sedentary character, and has led to an attention to small details which necessarily leaves the trace upon the individual, and has led, perhaps, to making our mental horizon a limited one.

At the beginning of the new century it may be well for us to take stock of the progress we have made, and to note in what special ways and to what degrees our empire, which now covers so immense an area as to be figuratively described as one which is bathed in perpetual sunshine, has increased in magnitude, in commercial prosperity, and in scientific acquirements, so that we, who occupy a very insignificant portion in this vast domain, may see if our advances are at all commensurate in extent.

Let us recall for a moment the condition of things at the beginning of the nineteenth century. A large and important slice of our colonial dominions had recently been severed from us, but its importance was not then realized, for who could have foretold the immense growth in potential wealth, in commercial prosperity, and in scientific enterprise which characterises the United States of America to-day? Correlated with this secession was that terrible struggle with our French neighbours, a conflict which had been working prejudicially against the advancement of science for many years, and was destined to continue its malevolent influence for many years to come. Although this century begins with a war-cloud hanging over it, we may feel very grateful that another continent has not repeated the historic episode, and that no loss of territory characterises the advent of a new century, and, notwithstanding the increase in taxation, that at the present time we have no such strain upon our resources as was felt by our progenitors from the effects of the French war. We may fervently pray that never again may the two great nations, which have so many things in common, with such enormous commercial interests at stake, and one so complementary to the other, be again led to the fratricidal arbitrament of arms, but that if they please they may vie to the utmost in colonial expansion, and especially in scientific research, because science, with its ever-widening radiations, and with its ever-increasing spread among the peoples, is one of the most powerful agents in linking in peaceful bonds the nations of the world.

In the comparatively limited time at our disposal it would be a physical impossibility to touch upon even the more important scientific discoveries made during the century, but we may be allowed to glance at the most striking advances which have been made in the knowledge of those sciences which are more intimately connected with our own calling, and chiefly those which are claimed to be the groundwork of our examination system, and which I think to some extent are occupying a too dominant feature in the present qualifying examination.

If we enumerate anything like the chief discoveries of science in the nineteenth century, we are astounded at their extent, and we are apt to think that progress has been more marked than during any preceding century of the world's history. But we must remember that there is such a thing as a mental as well as a scenic perspective. The last valley we traverse from brow to brow when looked upon from some contiguous height, appears

deeper and wider than those in the farther distance, even if they are of the same extent, and this process goes on until those remote, which may be equally important with the one nearest to us, sink into a dead level of uniformity, in which all gradations of altitude and all expanse of breadth are lost to the vision. It is so to a great extent with our mental estimate, yet we should not be surprised to find that in scientific and material progress there is an ever-accelerating speed and an ever-widening zone to occupy, for the periphery must be of greater dimensions as it is pushed outwards from the centre. If we remember for a moment that the population of England and Wales at the beginning of the nineteenth century was under 9,000,000, Scotland in round figures was about 1,600,000, and Ireland is estimated to have been about 6,000,000, while at the end of the century the population of England and Wales had increased by over 21,000,000, and Scotland by over 3,000,000, and although Ireland had decreased by 2,000,000, yet on the whole what an enormous addition has been made in the population of the United Kingdom! If this is true of the centre, what is the case with the British dependencies? At the present time the area of Greater Britain is as great as that of four Europes, containing a population of 400,000,000, of whom outside the British Isles some 10,000,000 are white people, so that not more than a tenth of the total population are white. A mere list of the names of the various possessions added to the British Empire during the century would take a very considerable space, but when one recollects that nearly, if not quite, all our African settlements and possessions have been the product of the century's expansion, while that enormous tract of India, including the Punjaub, Scind, Pegu, Burmah, Oude, etc., belong to the same category, it will be seen how immense has been the increase. In Australia the same progress has gone on, and in the Antipodes, which were in the early days of the century the mere dumping-ground for our criminal population, in which horrors unspeakable found a place, now the same geographical area is occupied by a law-abiding, loyal, and intellectual race, which has founded towns and cities, one of which at least is larger and more important than was any town in Britain in 1800, save London alone. The increase of people in the land of the blue gum has also its prototype in another hemisphere, for the home of the maple and spruce, Canada and British Columbia are now more important than the whole of our North American possessions were before the War of Independence resulted in the loss to us of such a valuable portion of territory as that which now con-

stitutes the United States, which, although separated from us as to forms of government, are united to us in close bonds of amity, and with common ideas and language.

As showing that side by side with growth of area and of population commerce has advanced *pari passu*, we may instance the fact that our exports and imports have risen from £85,000,000 in 1810 to £815,000,000 in 1900. The condition of Britain then may be imagined when we remember that in 1800 wheat was 113*s.* a quarter, and Consols stood at 62, and great suffering was endured by the poorer inhabitants of agricultural districts and manufacturing towns. The great mass of the people of these isles were uneducated, the percentage of illiterates being truly appalling, and crime was very prevalent in spite of the inhumanity of a barbarous penal code.

Notwithstanding the enormous increase in the size and importance of the British Empire in the last hundred years, the introduction of steamships and the formation of telegraphs have assisted to make the Empire in 1900 much more homogeneous and more easily governed than were the British possessions in 1800, when we were separated from India by a six months' journey round the Cape, and which has since become a forty and then a thirty days' journey through Egypt; by degrees this also has become shortened by better railway accommodation over the Continent to Brindisi, and by the facilities offered in an unbroken journey through the Suez Canal (which the introduction of electric lighting itself has shortened no less than six hours), until now the mails and special passengers may reach London within twelve or fourteen days after starting from Bombay. The four months' time which separated us from Australia has diminished to about a month, and the journey has been accomplished in twenty-eight days. Even the latter half of the nineteenth century has seen the Atlantic Ocean voyage shrink to a moiety of the period suffered by our grandfathers, and we have to thank Belfast for some of this expedition. To this shortening of the distances which separate one part of the country from another must be added the power which the electric telegraph wields in bringing each portion of the Empire in direct touch with the central authority, and it will be seen that such a great and important portion of our possessions as India is really now as close to London as the Outer Hebrides were to the War Minister of Lord Addington's Government in 1802.

To steam and electricity, therefore, are due this wonderful shrinkage in the size of the world, which has such profoundly

modifying and far-reaching influences upon commerce and civilisation, and the full effects of which are not yet realised.

Linked to these, and dependent upon the former, is the system of postal distribution, which participates to the full in the advantage of rapid and low-priced transit, and the enormous extension of which is most astonishing, no fewer than 2,246,800,000 letters being delivered in the United Kingdom alone. For 1*d.* a letter can now be sent to New Zealand, and a postcard has circumnavigated the globe in sixty-four days—even a more rapid journey than the brilliant sketch by Jules Verne told in fiction about twenty years ago. Year by year the area occupied by the penny unit of postage increases its diameter, and the signs of a universal penny post are in the air, and this very desirable thing will probably be an accomplished fact before many decades pass away.

Let us glance at the progress in some few departments of science and in its applications, for if distant places have been brought nearer and the world thus made smaller, and the peoples brought into closer touch with each other, so contrariwise, on the other hand, has our knowledge of far-distant things been made more accurate, our information about other times and climes than our own made more precise and thorough, and the hidden mysteries of nature and science been partly unveiled to our gaze. With this unveiling of nature, done as it should be with all reverence, man stands appalled at the vision opened out for his inspection, and, while remembering that our senses of taste and of smell have scarcely become more sensitive or enlarged in range, it must also be borne in mind that our power of vision has been greatly increased—we can by the aid of the telescope see farther than our ancestors, we can with the aid of the spectroscope see more deeply into the hidden nature of things, and with the assistance of the microscope we are enabled to differentiate forms of animate nature which moved unseen by the scientist of the early days of the nineteenth century.

A great cardinal difference between the early and the closing years of the century is that while in the earlier part scientists looked upon the various branches of animate life and the various forces of the physical world as separate and distinct, and that each living organism was the product of a specific act of creation, in the closing years of the nineteenth century the philosopher or the naturalist sees, or tries to see, the mutual relation of one form to the other or of one force to the other—sees, in fact, a universe itself linked with other systems, sees the mutual interdependence of one

form of organic life with the other, and the essential unity of life in all living things. In the body politic this truth appears to be slowly penetrating, although so far as the commercial interests of pharmacy are concerned we can find no trace that such an idea has ever influenced the legislation of Great Britain.

The same idea has been supported by the researches of Darwin in natural science, and of such chemists as Dalton, Newlands, and Mendeléef, and such physicists as Joule, who determined the mechanical equivalent of heat in 1843, and the law of the conservation of energy, which he developed in 1847; which two laws, with Newton's law of the conservation of momentum, and Dalton's law of the conservation of chemical elements, have laid the mechanical foundation for physical science, and, so far, the result of the investigations into the correlation of the physical forces has established the mutual dependence and the convertibility into each other of all the natural forces. Moreover, we have learnt that instead of the violent cataclysms of change which the earlier philosophers considered to be the means by which advances were made, that nature works by slow and orderly progression, ever advancing and ever improving, yet so slowly that to-day hardly differs from yesterday.

The advances in mechanical construction and engineering during the century are somewhat outside our consideration, and I cannot after so able an exposition on electrical progress as that which our erstwhile confrère Mr. Joseph Wilson Swan gave to the Society of Chemical Industry in Glasgow last week, venture upon that interesting subject, or to speak of the developments in British industrial chemistry, which has seen many changes in the century. I shall rather confine my attention to those matters which are closely related to the art and practice of pharmacy.

Photography.

Although the action of the solar rays upon various substances had been known from distant times, and although Scheele and others had studied the reducing effects upon nitrate of silver exerted by exposure to light, it was not until 1802 that Wedgwood gave an account of "A Method of Copying Paintings upon Glass and of Making Profiles by the Agency of Light upon Nitrate of Silver, with Observations by H. Davy," to the *Journal of the Royal Institution*, and in 1813 that Joseph Nicèphore Niepce demonstrated a definite photographic process which consisted in coating a metal plate with a solution of asphalt in oil of lavender

and exposing this in a camera for a prolonged time, as much as several hours being necessary. The unaltered asphalt was subsequently dissolved away by means of a mixture of white petroleum to which 10 per cent. of lavender oil had been added. Daguerre and Niepce later employed a solution of the residue left on evaporating oil of lavender dissolved in ether or alcohol. With this solution a silver plate was coated and exposed in the camera, but even with this more sensitive medium three hours' exposure was necessary. The vapour of pretroleum was used to dissolve away the unchanged resinous substance remaining on the plate.

In 1839 Daguerre introduced the process of photographing on silver-plated copper sheets which had been exposed to the fumes of iodine until the silver became of a golden-orange colour from the production of a film of iodide of silver. The plate was then exposed for about half an hour, and developed by subjecting the plate to the fumes of metallic mercury. The picture produced was then fixed with hyposulphite of soda. This process, known as Daguerreotype, there is good reason to believe, was, in part, the suggestion of Niepce, who for some time worked in collaboration with Daguerre. The Fox-Talbot process antedated by a month or so Daguerre's method—and I have seen a negative taken by him in 1835—but it is essentially the same as that made known by Wedgwood in 1802. In 1841 Fox-Talbot patented a colotype process which consisted of developing a paper sensitised with iodide of potassium by means of gallic acid and nitrate of silver. Daguerre's invention was almost directly tried for astronomical purposes by Dr. Draper, who obtained a Daguerreotype picture of the moon in 1840. One of the earliest Daguerreotype portraits in existence is in the possession of Sir W. Herschel, at Littlemore, near Oxford, and it was shown at the Chicago Exhibition, when the lady of whom it was a picture was still living. Professor Bond, an astronomer of the United States, exhibited some lunar photographs at the great Exhibition of 1851. Star pictures were first obtained by Mr. W. C. Bond, of Harvard, in 1850, and in 1857 his son, Mr. G. P. Bond, started on double star measurements on sensitive plates, choosing for his purpose the pair in the tail of Ursa Major. An albumen process on glass formed the transition to the collodion process, which was first suggested by Le Gray in 1850. This consisted, as you know, of a plate freshly coated with collodion, which, when still moist, was immersed in a solution of nitrate of silver; after being properly exposed, the plate was then developed with a solution of pyrogallic acid, with a small quantity of acetic acid as

a restrainer, or with a mixture of ferrous sulphate acidified with acetic acid, and from this time onward for many years the collodion-process was extensively used for portraiture and for astronomical and other scientific and artistic purposes. The prominences of the sun were photographed by this process by De la Rue in 1860, and in 1869 Stephen Alexander obtained for the first time a good picture of the corona, and thus the true nature of the prominences and the corona were finally ascertained.

Eventually moist collodion plates, which would keep for a few days, were introduced, as the difficulties in freshly sensitising plates before exposure when away from the studio were very great drawbacks. In this process nitrate of zinc, a very hygroscopic salt, was used to retain the moist condition. Gradually the way was led to the introduction of the dry plate by M. Gaudin in 1854, in which the sensitised collodion film on the plate was preserved by protecting it with a second film of albumin. About 1860 the alkaline developer was introduced, and this method led to the employment of bromide instead of iodide of silver, and the developer used was either pyrogallic acid, or, as Abney pointed out in 1880, hydrokinone was even more effective. In 1871 Dr. R. L. Maddox, instead of emulsifying the silver salt in collodion, used a solution of gelatin, and this idea has been in various ways improved upon until we have the rapid, and portable, and durable plate so well known to us all. It may be worth while to mention that it was found by Mr. Joseph Wilson Swan, a pharmacist, that by raising the temperature of the vessel in which the emulsion—consisting of iodide and bromide of potassium, nitrate of silver, gelatin, and water—was being prepared, and keeping it boiling from half to one hour, the resulting product became extremely sensitive, and thus very rapid plates were able to be produced, so that from the half-hour which a Daguerreotype required for exposure, plates are now made so sensitive as to record the exposure of two-thousandths of a second. Since the first star-photographs were obtained a large number of the minor planets have been discovered by the aid of photography, the very important discovery of the Röntgen rays has proved of great value to surgery, and by the use of photography the resulting skiagraphs are capable of being studied at leisure or preserved for reference. Besides these, photography has been enlisted as a willing servant into microscopical and physical investigations, and has been employed for the purpose of automatic registration in many branches of natural science, and in the arts and crafts. Colour photography, too, is

being brought within the range of practical adoption instead of remaining a mere dream of the scientist or toy of the experimentalist.

The sale of photographic materials is a branch of business that pharmacists have largely taken up, and it is quite within their scope, since it needs scientific knowledge, and accuracy and delicacy of manipulation. We may well adopt the motto once suggested by a Chancellor of the Exchequer, although not in the sense he meant, *Ex luce lucellum.*

Chemistry

existed as a science long before the beginning of last century, but its development during the period we are glancing at has been phenomenally great. Not only have large numbers of new elements been discovered, but some which were suspected to exist have been isolated from their compounds, and many others known only in the gaseous state have been condensed into a solid state. The great domain of organic chemistry has been unfolded to our view. Various laws have been propounded which have crystallised nebulous ideas into a definite form, and arts, commerce, and the health of the nation have been increased by important discoveries in this fascinating science. Our Pharmacopœia gives a list of thirty-two elements, including gold, silver, copper, sulphur, lead, zinc, iron, carbon, tin and mercury, which have been known from very ancient times. Of the remainder no fewer than eleven were added to the list of elements during the last century. Our countryman Sir Humphry Davy's discoveries stand conspicuous, since we owe to him the isolation of calcium, potassium, sodium, and magnesium, the last an important adjunct to the photographic chemist's business. Davy also first clearly demonstrated the elementary character of chlorine and barium. Aluminium was first isolated by Woehler in 1827, and few could have anticipated that it would be produced in such enormous quantities and be put to such varied uses, nor should we have ventured to predict that one of the results of the discovery would have been the injury of the beautiful Falls of Foyers in Scotland, and yet this utilitarian age has used the water-power from that source for the purpose of obtaining the electric current to reduce from its salt this particular light and pliant metal. Iodine, now so extensively used in the arts and medicine, was isolated by Courtois in 1811, and it is especially pleasing to pharmacists that the improved method of its preparation was suggested by a former genial President of this Conference,

whose travels into the western islands of Scotland in search of rich beds of seaweed some of us have heard him dilate on in his charmingly realistic style. Lithium was discovered by Arfvedson in 1817 in the mineral petalite, and its salts have become of great interest to pharmacy. Cerium was first positively identified in 1803, and its oxalate has a somewhat extensive use. In addition to the official elements, another discovered by Davy in 1808—namely, strontium—affords salts of great value to the pyrotechnist, and the bromide and iodide are now frequently prescribed by therapeutists. Although the element fluorine was long suspected to exist, its isolation has only recently been effected by the brilliant work of Moissan with the electric furnace. I need not further allude to the large series of the minor elements which have been discovered since the year 1800, for, as is now the case with the discovery of a new asteroid, the finding of an additional one creates but little enthusiasm, but it may be that among the highly radio-active elements obtained from pitchblende, substances of great interest to the photographer may be obtained. Among the minor elements one ought, perhaps, to name thallium, discovered by Crookes in 1861, on account of its interesting spectrum; and selenium, discovered by Berzelius in 1817, is of extreme importance from its curious property of being a non-conductor of electricity under normal conditions and in the absence of light, but under the influence of light becomes increasingly conductive. This property has been taken advantage of in order to steer a submarine boat by impinging upon a selenium-plate the beam from a searchlight situated on the shore, and the same property has been utilised in order to transmit from one place to another a picture of a living object, so that it is stated a picture, say, of a person in Paris may be seen by another in Orleans, while they are actually conversing with each other through the telephone.

Several gaseous elements have been added to the list during the century, and our own countrymen, Lord Rayleigh and Professor Ramsay, have succeeded in isolating argon and helium, a discovery so nearly forestalled by Cavendish almost a century before. The gas given off by the hot wells at Bath contains a considerable percentage of helium, and it may be worth inquiry whether the comparatively large quantity of gas which the French chemists estimate as azote, given off by the thermal springs of Hammam Mesquotine, in Northern Africa, may not contain the same element in even larger proportions.

I cannot venture to tell you in detail what has been done during

the century in converting substances previously known only in the gaseous state into the liquid, and, in most instances, solid forms. Pictet, of Geneva, Olszewski, Dewar, and others, have done excellent service in this field, and Dewar's liquefaction and solidification of hydrogen, with the researches correlated to it, have brought us within a few degrees of the zero of temperature—the cold of that interstellar space—

> That lucid interspace of world and world,
> Where never creeps a cloud or moves a wind,
> Nor ever falls the least white star of snow,
> Nor ever lowest rolling thunder moans,
> Nor sound of human sorrow mounts to mar
> The sacred everlasting calm.

In this low temperature of liquid hydrogen the pulses of life are stilled, and chemical action slows down, so that phosphorus and oxygen remain together unchanged, and fluorine scarcely reacts with elements with which at ordinary temperatures it combines with in such a furious manner.

Lord Kelvin's suggestion that life may have conceivably been brought to this planet by some meteoric visitor was by some scientists held to be impossible, inasmuch as even if it could have resisted the heat created by the passing of the meteor through our atmosphere the seed, or spore itself, would have been previously killed by the cold of interstellar space. This latter portion of the argument is negatived by Dewar and Horace Brown's experiments with seeds, which germinated after six hours' immersion in liquid hydrogen, temperature 453° F. below that of melting ice.

Laws of vital importance have been formulated during the century which have lifted chemistry into the exact sciences. I need only allude to Dalton's atomic theory, first suggested in 1804, and more fully expounded in 1807. To Dalton we also owe the first attempt to represent, by means of symbols, the composition of chemical substances; but it is to Berzelius we are indebted, in 1811, for the first employment of letters of the alphabet for this purpose. Later on came the enunciation of the "Law of Octaves," first propounded by Mr. John A. R. Newlands in 1863–6, and developed into the Periodic law by Lothar Meyer, of Tubingen, and Mendeléef, of St. Petersburg. It is a triumph of theoretical speculation, which, like its counterpart in the science of astronomy, has taken a dominating position. Isomeric substances were first noticed by Liebig in 1824, who found by analysis that fulminic

acid has the same composition as cyanic acid. The foundation of stereo-chemistry was laid by Pasteur's researches into the properties of racemic acid. While the discoveries in inorganic chemistry during the century have been so extensive, it is, perhaps, in the domain of organic chemistry where the greatest scientific conquests have been made. If we take a branch of chemistry which is of especial interest to us—namely, the alkaloids, we shall find that all of them are the products of the nineteenth century's research. The alkaloids of cinchona bark were obtained in an impure state in 1803 by Duncan, but Pelletier and Caventou in 1820 first properly distinguished quinine and cinchonine; morphine in an impure state was obtained by Durosne in 1803, but it was left to Sertürner in 1816 to prove its basic nature and its distinction from narcotine. The glucoside salicin was not obtained until 1830. Now the output of these three is enormous, and their use has revolutionised one extensive source of production, transferring, as it has, the culture of the cinchona from the western to the eastern hemisphere, and that culture has become so well understood that the cinchona forests of Ceylon have come and gone during the latter half of the century; even in India the culture has ceased to be a commercial venture, and Java, in the Netherland Indies, practically supplies the world with cinchona for quinine making. The British Government still does a little in bark harvesting and quinine making, but this is mainly to bring cheap quinine into the hands of the poor natives. Not only have these and other alkaloids and similar principles been isolated during the century, but their structure and constitution have been so closely studied that in a few instances they have been synthetically prepared.

The active principles isolated are now appalling in number, and they have assisted to most widely change the character of our dispensing, since they have aided the exhibition of medicaments in a portable and concentrated form, which has resulted in the substitution of the pill or pellet for the more bulky and profitable mixture. Still more recently from the laboratory of the chemist has flowed that stream of artificial compounds whose fearsome constitution their patentees have often used some catchword to designate, many of which possess marked therapeutic action, and are in large popular demand. The enormous amount of work on organic chemistry is utterly beyond our scope, but it may be appreciated if one consults the great work of Beilstein, the *Handbuch der Organischen Chemie*, in six large octavo volumes, giving a concise guide to the organic compounds whose constitution is known, and

to this may be added Richter's *Kohlenstoff-Verbindungen*, in two large octavo volumes and supplement.

The discovery of chloroform by Liebig in 1830, and independently by Soubeiran in 1832, let to a revolution in surgery; but this, of course, was not until its effects had been tried upon animals in 1842 by Dr. M. Glover. In 1847 the celebrated surgeon, Sir James Simpson, used it as an anæsthetic agent, and from that time to the present it has, either by itself or associated with other compounds, been most extensively used in surgical operations, with the result that not only has a great diminution in the death-rate from operations followed, but their range has been also immensely extended, and the use of the knife or scalpel on the most sensitive portions of our frail humanity is now rendered painless. The corresponding iodine-derivative, iodoform, was discovered by Serullas in 1822; but its composition was first determined by Dumas, who also made elaborate researches on chloroform, in 1834. Mosetig-Morhof introduced it as a surgical dressing in 1879, but it did not come into general use for disinfecting or antiseptic purposes until the eighties.

Waste-products Utilisation.

Perhaps in the utilisation of waste-products we may claim for the nineteenth century some of its greatest achievements in chemical research. Aniline was discovered by Unverdorben in 1826, but it remained only as a chemical curiosity until the discovery by William Henry Perkin, when he was but a boy of eighteen, of the aniline colour mauve, which led the way to the production of the extraordinary series of colour-derivatives, and led to the establishment of an important industry, which for a time was of great financial value to British manufacturers, but which recently has been more and more taken from us by our German competitors. Anderson's discovery of anthracene also was of great commercial importance. Linked with these discoveries from the coal-tar series was the introduction of carbolic acid and its homologues for disinfecting purposes, and this again led to the establishment of a very large output; but the indiscriminate and unrestricted sale of carbolic acid and its dangerously poisonous nature led to a terrible death-roll, which has only been checked by the tardy action of the Privy Council in placing the sale under the same conditions which govern that of laudanum or other poisons.

High explosives are also discoveries of the time I have indicated, and one of them—trinitrin, discovered by Sobrero in 1847—

has proved to be of great remedial value and a powerful agent in relieving arterial pressure; while in combination with kieselguhr it is manufactured on an immense scale, under proper precautions and with a minimum of danger, and it is now one of the safest and most largely used explosive substances for mining purposes. Pyroxylin, discovered by Schonbein in 1847, is in one of its modifications largely used in pharmacy under the form of a solution in ether, and other compounds with camphor form the material celluloid, which is now so extensively made for such varied uses, among which may be instanced the support for the sensitised film, which has made a revolution in another industry to which I have already alluded.

Although the inflammable and illuminating properties of coal-gas had been known from remote ages, it was not till 1793 that W. Murdoch first manufactured gas for lighting purposes at Birmingham, and in 1803 the Lyceum Theatre was thus illuminated. From that time till the eighties the amount of coal distilled for this purpose gradually increased until as much as 120,000,000 gallons of coal-tar were produced in a single year in the United Kingdom alone. Not only was there this immense amount of a single product, but a large quantity of naphthalene and other derivatives was also produced. This more powerful illuminant, which also had the advantage of saving trouble, to a very great extent drove out of use the heavy illuminating oils and candles from our larger communities. During the latter part of the century the rural districts have also changed their illuminant, as they have availed themselves of the petroleum which has been sent over in such enormous quantities from North America, especially from Pennsylvania, where the wells of oil have brought a Pactolean stream of wealth, almost passing comprehension, to the Rockfellers and others, and, alas! has also led to the formation of one of those gigantic commercial trusts which promise to be of such deadly danger to the body politic. Not only from the Western, but from the Eastern hemisphere, from the shores of the Caspian Sea at Baku, where the ever-burning pillars of fire were for many ages the unsuspected indices to the store, is produced the same material.

The heavy oil which remained after the lighter oil had evaporated or been distilled away was, for a considerable period, discarded as a waste product. I need scarcely draw your attention to the fact so well known to you of the utilisation of this product after proper purification, as it has been introduced into pharmacy under the name of "vaseline," and now not only this, but similar heavy

petroleum bodies, are most extensively used by pharmacists. The solvent powers of light petroleum have been taken advantage of in the preparation of alkaloids, especially of quinine alkaloids, and the heavier liquid oils are now also in extensive demand as lubricants. Mineral shales in Scotland and in Eastern Europe and Western Asia have also been used to prepare the heavy paraffins and lubricating oils, and the amount of paraffin used for candle-making is now in excess of the supply from the hard fats of the animal kingdom.

Acetylene, first discovered by E. Davy, and still further investigated by Berthelot, has risen into considerable popularity, especially on the Continent. It gives a very brilliant light, but, unfortunately, like coal-gas, yields a very large amount of soot. One chemist in my county has used it for some years, and finds it not only very cheap, but he says it gives very little trouble. That it is of considerable commercial importance may be gathered from the fact that Mr. Lewes has published a book of about a thousand pages upon acetylene alone.

I cannot trust myself to speak of the achievements of geologists during the century, which have enabled geology to take its definite place amongst the inductive sciences.

Although the word

BIOLOGY

was unknown at the beginning of the century, being first employed by Treviranus in 1802, and, indeed, did not come into general use till the century was well on its way, the two divisions of animate nature were, of course, differentiated long before our time. At the close of the eighteenth century the study of both branches was wrapped in the swaddling clothes of a narrow system of classification, and the real vital questions of both the animal and the vegetable kingdoms were obscured by a too close devotion to the library or the study, rather than to the open book of nature, which has a new truth on every page, and in which, pore as we may, there is still some secret to unravel.

At the beginning of the nineteenth century it was an article of faith to consider a species a fixed immutable entity, especially created, and as Linnæus in his *Fundamenta Botanica* says, "*Species tot numeramus, quot diversæ formæ in principio sunt creatæ*," and by the great majority of the civilised human race believed to have a strictly limited lineage. This opinion was but slightly modified, notwithstanding that Lamarck stated in his

Philosophie Zoologique of 1809 that his belief was that species themselves are descended from preceding species, until another half-century passed by, when the researches of two eminent countrymen of our own opened the door for other and wider views. The first of these was Alfred Wallace, connected by marriage with the family of one of our own members, the veteran bryologist Mitten, of Hurstpierpoint, and the other the immortal Charles Darwin, who has elevated the theory of the evolution of species into a scientific canon, and whose work, the *Origin of Species*, has vivified the dead bones of a narrow formalism, and led us to a more comprehensive study and a more elevated point of view of organic life, which enables us to see that affinity means a closer relationship than mere similarity, and instead of being fortuitous, is dependent in so many cases upon a common ancestry.

I cannot venture to weary you with many instances of the manner in which vexed zoological questions have been solved by the unwearied efforts of biologists since the advent of the nineteenth century, but two examples may suffice.

First, sheep-rot. This was known as a troublesome pest, causing great loss to the agriculturist, and was known to be produced by a worm, the "fluke." Farmers attributed the disease to various causes, among which were wet seasons, living in very wet pastures, or the presence of certain herbs in the fields, and one of these often found in wet, marshy ground, *Hydrocotyle vulgaris*, was especially blamed. The cause was, however, clearly proved to be of a very different nature by a worker in the Museum Laboratory at Oxford, who by a brilliant series of researches was enabled to trace the life history. He had been led to believe that the worm was one of those organisms which in one of its transitional stages passed a period of its life in another host, and probably in a snail. This he was enabled to prove, and it was found that snails feeding in pastures where there are sheep infested with fluke, in devouring herbage swallow some of the excreta of the sheep, in which great numbers of the fluke-ova abound, the egg in due time hatches, and the young larvæ encyst themselves in the snail. If a sheep accidentally swallows the small snail which lives on the herbage growing in wet places, the encysted worm in passing through the alimentary canal develops into an active stage, and, boring through the intestines, eventually finds its way into the liver, where it grows into the flat tadpole-like worm so well known and so much hated by the farmer.

The second instance is that of the common eel, which puzzled

philosophers since the time of Aristotle till the year 1896, when it was the privilege of an Italian savant, Signor Grassi, to explain the extraordinary transitions through which it passes. Shortly stated, the facts are these. Eels living in our lakes and rivers follow a course exactly opposite to the salmon, which, as is well known, leaves the sea for fresh-water streams in which to spawn, and one must see to realize the efforts these fish make to get over any obstacle that impedes their upward course. In our fresh-water streams neither spawning eels or even mature eels are found. It was conjectured that they went seawards to deposit their ova; but who could have guessed the true facts, or can even now realize that wonderful power of instinct which is exhibited? It is true that the eels do go to the sea to spawn, but, not content with shallow water of our coasts, they go onwards and downwards till, in such deep waters as are found in the Mediterranean near the Straits of Messina, they find the bourn for which they have been in quest. A gradual but considerable change takes place in their appearance, which is to some extent rendered necessary in order to accommodate themselves to the pressure exerted by the weight of 250 fathoms of water. In the dark recesses of this comparatively unmolested breeding-place they spawn, and the large eggs float, but do not rise in the water. From these eggs are hatched a young fish as unlike an eel as can well be imagined, for it is flat, transparent, colourless, tape-like, and devoid of red blood. These organisms had long been known, and have, in fact, been named *Leptocephali;* but the great ichthyologist, Günther, suggested they were abnormal larvæ incapable of further development, until Grassi found this not to be the case. The young eel, having completed its first stage of growth in the deep waters, ceases to feed, loses bulk, and secretes pigment on the surface of its body. With this change is co-ordinated the shedding of the larval teeth and the replacing of the larval skeleton. Then the fish begins to feed again; it gradually comes nearer to the surface, and when it is about a year old and two inches long it enters a mouth of a river, and is an elver or young eel.

For the division of biology which comprises the vegetable kingdom, with which we are the more interested from its being now a special subject in pharmaceutical education and examination, we use the term

BOTANY,

but the name certainly does not convey to the outside world an adequate idea of the huge and varied conglomerate of many sciences

of which this many-faceted subject is really composed. At the beginning of the century Sir James E. Smith had divided it into eight sections, but so far as the systematic side was concerned, the same restricted view was taken as that which characterized the study of the division of zoology. The progress of the century has resulted in the same development of our ideas as to the origin of the vegetable system, and notwithstanding the researches in palæophytology by Brogniart, Schimper, Solms-Laubach on the Continent, and in our own country by Lindley, Carruthers, Williamson, and our own examiner, Seward, there are many gaps which still remain unfilled; no fossil plant has yet been discovered which cannot be classified into one of our known groups, although some new families have been found. On account of the more delicate and perishable character of plants, their preservation has in many instances been very incomplete, or in still more instances has not been effected, so that it cannot be said that the ancestry and development of our existing flora has been definitely traced; yet, on the whole, it may be assumed that there has been an evolution of the higher from lower forms in the successive geological periods similar to that which has occurred in the animal kingdom. We see in Palæozoic periods the predominance of pteridophyta, in the Mesozoic the gymnospermous plants prevail, while in the Tertiary and Quaternary times the more highly developed angiosperms abound; but although there is some good reason to believe that the earliest plants were algæ, and these occur in the Cambrian formation, yet there are at present no gradual transitional forms known which show in what manner the vascular plants found in the Silurian or Devonian rocks have been developed from these or the siphonaceous algæ of the Palæozoic era.

For a full account of the history of the progress of botany in the nineteenth century I may direct your attention to the exhaustive Presidential address by Professor Vines to Section K at the Bradford meeting of the British Association last year, and some portion of which I have epitomised here. First, as to the increase in number of the known species of plants, in the synopsis of 1809 Persoon enumerated about 20,000 species of phanerogams; at the end of the century it will be found that they number about 105,000—a very astonishing increase. The pteridophyta now amount to about 3,500; the bryophyta to 7,650; while the fungi, in which are now grouped the bacteria, according to Saccardo's estimate, amount to nearly 40,000; the lichens to 5,600; and the algæ, including 6,000 diatoms, are stated by De Toni to number 14,000. These, added

together, reach to the enormous number of nearly 176,000 species of living plants. Necessarily this immense total is partly accounted for by the great extent of freshly-explored country opened up during our period; but we can also recognize here the enormously accelerated impetus in scientific investigation which has resulted in enlarging the number of known species of flowering plants by over five times the amount recorded a hundred years before. Again, the transference of bacteria, formerly thought to belong to the zoological section as infusorial animals, has very materially added to the number of species now classed in the vegetable kingdom, and it may be that a more complete study of the life history of the tiny, but yet most active, agents will show that in many instances they are not specifically different, but are races, or mere modifications, owing to local conditions; yet Professor Saccardo believes that the total amount of existing species of fungi alone is as many as 200,000, and that the total number of species of plants in the world reaches to 400,000—a field sufficiently wide for the most ardent systematist to explore even during the present century. A few words must be given to

The Flora of the United Kingdom.

At the close of the century British botany was still under the influence of the Linnæan system. The closing years of the eighteenth century had been marked by the publication of three editions of Withering's *Natural Arrangement of British Plants*, but a more important work had also been commenced by the issue of Sowerby's *English Botany*, the text of which was contributed by Sir James E. Smith, while the coloured drawings were from the pencil of James Sowerby. Although not so well executed as the figures of plants in Curtis's *Flora Londinensis*, it was meant to do for the British Isles what that work did for a more limited area. Before the opening year of the nineteenth century eleven volumes, containing 522 plates, had appeared, and the work slowly progressed until the thirty-sixth and completing volume was published in 1814. Altogether 2,592 plates are figured, and included 1,445 phanerogams; but of these only about 1,190 are native species, and according to our present ideas 76 are varieties and 13 are hybrids. In addition 55 pteridophyta and 6 species of characeæ, of which one fern is not native, are included, 128 denizens and aliens are included, and 38 are either errors or plants of quite casual occurrence.

The remainder consists of 423 bryophytes and 663 algæ and

lichens; 26 species of phanerogams were for the first time recorded as British plants. But this work was actually for the greater part preceded by Smith's *Flora Britannica*, published in the years 1799–1804, which is written in Latin, and extends to 1,406 pages, and describes 1,345 species of flowering plants and vascular cryptogams, but of these 23 are erroneously reported as natives of Britain, and 6 are either errors of identification or are only of casual occurrence, which are not now admitted to our British lists. Fifty more are treated as full species, which, by botanical authorities of the present time, are either considered to be varieties or hybrids. Deducting these, we find about 1,260 plants which are now treated as species in the London catalogue were described in it. But there are also references to at least forty varieties which are now considered to be full species, so that the number of British species then enumerated, judged by the present standard, was about 1,300, as against upwards of 1,900 at the present time; but of these the segregation of the brambles and hawkweeds is answerable for over 180. It must, however, be borne in mind that many plants mentioned by the older authorities are not given in Smith's *Flora Britannica*, but even with all these deductions we see that the nineteenth century witnesses a very considerable advance in the number of species known as occurring in the British Isles, and of these *Inula salicina*, *Erica mediterranea*, *E. Mackai*, *Spiranthes Romanzoffiana*, *Habenaria intacta*, *Sisyrinchium angustifolium*, *Potamogeton Kirkii*, *Carex fusca*, *Rosa hibernica* (found in 1795 near Belfast, but now recognized as a hybrid of *R. canina* and *spinosissima*), *Pinguicula grandiflora*, and *Saxifraga Geum* (but originally found, although not described, long previously) belong to the Irish flora.

In 1821 *The Natural Arrangement of British Plants* was published, being the work of S. F. Gray, greatly assisted by his son, John Edward Gray. As its name implies, this work discards the artificial arrangement of Linnæus, and shows the relations of plants to each other as already taught by Jussieu, De Candolle, and Robert Brown. In 1824 Sir James E. Smith published the two first volumes of *The English Flora*, the concluding fourth volume appearing in 1828. In 1830 Sir W. J. Hooker issued his *British Flora*, which, like the last named work of Smith, also followed the Linnæan arrangement. In 1843 Babington, in his *Manual of British Botany*, adopted the natural system, which has since held sway, but also in another way departed from the stereotyped method which had for too long a period obtained, and from a care-

ful examination of the plants in the field, and by comparison with continental specimens, did much to do away with the reproach English botanists had laid themselves open to of being too insular. I need not further trace the progress of British botany except to add that in 1863 a third edition of *English Botany* was commenced under the editorship of Dr. Boswell Syme, and the excellent descriptions of the species given there are the best we possess, but the reprinted figures are not so well coloured as in the original, nor do they compare favourably with those in the great floras of Germany, Denmark, or Greece; the last named contains the finest, most artistic, and most accurate of any floral drawings yet produced, which were the work of the Austrian artist Ferdinand Bauer from plants collected by Dr. John Sibthorp, and the plants and original drawings are still preserved in the herbarium at Oxford, where he was professor of botany. Not only have these general floras of Britain been produced, including the excellent *Student's Flora of the British Islands*, by Sir J. D. Hooker, which appeared in 1870, and the more compact *Handbook of the British Flora*, written by George Bentham, issued in 1857, but the attention of British botanists has been also paid to smaller areas, and many excellent county floras have appeared, and of these Trimen and Dyer's *Flora of Middlesex* and Briggs' *Flora of Plymouth* set a very different standard from the mere lists of plants which had been characteristic of the preceding century. Now the floras of more than half of the English counties have been published.

We owe a great debt of gratitude to Mr. Hewett Cottrell Watson for his works on geographical botany, and to him we owe a large part of what is known of the distribution of plants through Britain. Fired by his example, Mr. D. Moore, of Glasnevin, and Mr. A. G. More, of Dublin, compiled the *Cybele Hibernica*, of which a second edition, by N. Colgan and R. W. Scully, has recently appeared, and this does for Ireland what Watson's *Cybele Britannica* did so well for the British flora. The systematic study of the lower branches of the vegetable kingdom has also been assiduously followed, and in 1845 Hassall published two volumes describing the freshwater algæ, and Harvey in the same year issued his *Phycologia Britannica*. In 1857 my old friend the Rev. M. J. Berkeley published his classical *Introduction to Cryptogamic Botany*, and during the next dozen years many new fungi, numbering in all nearly 6,000, were described by this eminent worker. In 1855 Wilson published his excellent *Bryo-*

logia Britannica, with accurate figures and descriptions of our British mosses; and in 1871 Leighton brought out the *Lichen Flora of the British Isles;* while M. C. Cooke in the same year issued his *Handbook of the British Fungi.* In 1860 Pritchard completed his *Infusoria*, which included also desmids and diatoms. In 1880 Dr. Braithwaite commenced his comprehensive *British Moss Flora*, which is still in progress, and this and the more modest *Manual* by Dixon and Jamieson testify to the zeal of British bryologists, by whose researches during the century the moss flora has been more than doubled.

In concluding this note of the systematic work of the period I must allude to the production of Bentham and Hooker's *Genera Plantarum*, which was issued during the years 1862–83—a monumental work worthy of the highest honour, in which the Candollean classification is adopted; and another gigantic undertaking has been also completed in the *Index Kewensis* of 1895, which was compiled by Mr. Daydon Jackson, under the direction of Sir J. D. Hooker, which gives the names of all plants published from the time of Linnæus up to the end of 1885. Special monographs on various groups of British plants have been published, which have done much to assist those field botanists who are especially interested in critical genera. Among these we may single out that on the British hieracea, which is being prepared by one of our own members, Mr. F. J. Hanbury (the worthy bearer of an honoured name), illustrated by very beautiful lithographed drawings; the excellent account of the potamogetons of the British Isles, from the pen of Alfred Fryer; the works on the British rubi, by Professor Babington, and more recently by the Rev. W. Moyle Rogers, which have increased the number of British fruticose rubi by nearly a hundred species; and that on the *Characeæ*, by Messrs. Groves; while the willows have been described by Dr. Buchanan White in the pages of the Linnean Society's *Journal*, with the result that many of the plants considered to be good species by Sir James E. Smith and the salicologists of the early part of the century are now treated either as hybrids or varieties—an object lesson, perhaps, for those botanists of our own time who have so laboriously increased the number of species of hawkweeds and brambles. The roses were also described by Mr. J. G. Baker in the same journal, but they now require a fresh monographer, since the work of the veteran Belgian botanist, M. Crépin, shows that a different view of specific limitations will considerably modify the arrangement in the immediate future. We may take

this opportunity of congratulating Mr. Baker, jun., who was originally a member of our craft, for the interesting work he is doing at the British flora, especially in the *Viola* group. Good work has also been done at the algæ by our late President (Mr. E. M. Holmes), and the freshwater forms are being investigated by Mr. West, and the mosses—especially those of India—have been very carefully studied and described by the veteran botanist, Mr. Mitten, already alluded to; and these workers are all connected with our calling of pharmacy.

In another department, which he made especially his own, Daniel Hanbury delved in the storehouse of the past, and acquainted himself with the drug-markets of his day, in order, in conjunction with Professor Flückiger, to prepare the standard work *Pharmacographia*, which appeared in 1874, on a much too neglected subject. A very useful and praiseworthy work on *Medical Plants* was prepared by Professor Bentley and Dr. Trimen in 1880, which lifted a reproach from the shoulders of British botanical pharmacognosy.

To show that something has been done also in the delineation of new or interesting species of plants from a horticulturist's point of view, I may state that the three chief magazines devoted to this subject—namely, the *Botanical Magazine* (7,241), Hooker's *Icones* (2,675), and the *Botanical Register* (2,692)—have figured 12,614 plants during the century.

The Systems of Classification

have been modified by the discovery of the eminent botanist Robert Brown, in 1827, of the gymnospermous nature in the ovule in cycads and conifers, which has resulted in the separation of the former from the monocotyledons, and of the latter from the dicotyledons, and formation of them into a fresh sub-class, the gymnosperms, which are now looked upon as being a distinct group of archaic phanerogams.

Lichens, which were considered a distinct section of the vegetable kingdom, notwithstanding that Haller had a glimpse of the true state of things in the preceding century, have been proved to possess a dual nature, as it was reserved for Schwendener in 1869 to make a definite statement that a lichen consists of two distinct organisms, a fungus and an alga, living in symbiotic union, as De Bary had previously suggested, and this is the view now generally accepted. Symbiosis is an extraordinary condition which allows two distinct organisms to exist together, as Marshall Ward

has happily said, "like a small limited liability company," mutually assisting each other—but not, I think, with an unqualified directorate—and examples are also found in the animal kingdom. There are many interesting instances of symbiosis, especially the widely spread examples in which a mycorhiza is symbiotic with the rootlets of trees such as the *Cupuliferæ*, willows, and pines, which grow in rich humus soils, as also many plants such as the heaths, many orchids, and gentians, and especially those in which there is a deficiency of root-hairs, the hyphæ of a fungus act as the carrier of organic matter to the larger organism. This fact explains the dying out of many plants, such as heaths and orchids, and even conifers, when they are planted in soils deficient in humus, and consequently the absence of the mycorhiza, which in congenial circumstances breaks up the food and introduces it to the stronger plant, which in return gives something of its strength, as well as affords a lodgment, to its more lowly companion—a property quite different to that direct robbery of nutrition from a host by a mere parasite such as the dodder or broom-rape. But there are instances of a more malignant symbiosis when two organisms—for instance, a bacillus (*B. Oleæ*) and the hyphæ of a fungus (*Chætophoma*)—set up a disease in a tree, such as the olive, on which they subsist, and to which they do great mischief; and it may be that one of the most deadly scourges of mankind—carcinoma—is of this character.

It was reserved for De Saussure to demonstrate, in 1804, that plants derive by no means an inconsiderable portion of their food from the soil; but it was not until 1860 that the researches of Boussingault, and of Lawes and Gilbert, showed that plants do not absorb free nitrogen from the air by means of the leaves, as Priestley and Ingen-Houz in the preceding century had contended. It is true that plants do absorb nitrogen, but this is not done by the leaves, but through the agency of bacteria in the soil, or, as in the case of the Leguminosæ, actually in symbiotic union in tiny root-nodules of the plant itself. This curious property is of great economic value, as it explains how an impoverished soil, poor in nitrogen, may be made to accumulate it by growing lupines, lucernes, sainfoin, or vetches on it, as has been pointed out by Schulz Lupitz; and commercial advantage of this discovery has been made by pure cultures of the bacteria being offered for sale, in order that the seeds or soil may be infected with the organism.

With regard to the process of fermentation, the word as employed by the writers of the nineteenth century meant a process of brew-

ing of beer, or the making of wines and spirits, and was supposed to be essentially a chemical action, notwithstanding the fact that Leeuwenhoek, of Delft, discovered the globules of yeast in fermenting wort nearly two hundred years ago; while La Tour and Schwann and Kuetzing, in 1840, showed that these globules were budding plants, living on the sugar of the liquor, and should be classed among the fungi. This discovery of the nature and use of yeast led the way to further investigations, and while Rees, in 1870, gave the name *Saccharomycetes* to the fungus, he also showed that several species exist; and in 1883 a Dane (Hansen) found by special culture of a single spore it was possible to obtain a constant type of pure yeast, with its own peculiar property—a discovery which has been of immense importance to the brewer, who is now enabled to minimise the loss which was formerly caused by beer souring or becoming thick from after-fermentation, and which in certain seasons, or with bad yeasts, came back from the retailers in large quantities. But it has been more recently contended that yeast itself contains an enzyme, named "zymase," which has been extracted from it, and that this ferment is actually the cause of the fermentive action. I need scarcely here draw attention to Professor Green's excellent work on these plant-ferments.

Diastase is another ferment of immense importance, belonging to the class of unorganised enzymes, which was made known by Payen and Persoz in 1833, who extracted it from malt; and they found this principle was capable of converting the starch of grain into sugar—that is, the reduction of the more complex carbo-hydrates into others of simpler form—and I need scarcely remind you of what commercial importance, from a pharmaceutical point of view, the preparation of malt-extract has become, which depends for its value upon the percentage of diastase it contains. The diastatic power of *Aspergillus*, one of the mould fungi, is utilised in the preparation of Indian soy from the soja-bean, and a patented process for obtaining diastase from *Aspergillus* exists. There are many others, such as cytase, glucase, inulase; and there are other enzymes which decompose glucosides, such as emulsin, myrosin, etc. There are some also, such as the trypsins, which act on proteids; while others—lipases—change fatty matters, and another class, the oxidases, change organic substances, and familiar examples exist, such as the brown colour produced in apples which have been bruised and the blue colour shown when *Boletus luridus* is cut; and it is not unlikely that the blackening of certain plants during the process of drying, such as the cow-wheats and

certain bedstraws, may be owing to the presence of an oxidase enzyme.

To an Alsatian, De Bary, we owe the foundation of modern mycology, and his brilliant discovery of heterœcism marks an epoch in our knowledge of the wonderful ways in which Nature works in order that an individual organism can be perpetuated. One of the most vexed questions which puzzled the fungologist was the life-history of the wheat-rust—a parasite which is alluded to in the Book of Genesis, and which, from its destructive action on our cereal crops, is of vast agricultural importance. The disease, as you know, was formerly considered to be caused by the wheat-rust (*Puccinia graminis*); but many people, especially farmers, believed that the presence of the barberry plant, on which occurs a fungus known as *Æcidium berberidis*, seemed to have some relationship to the presence of wheat-rust, and as early as 1660 a law existed at Rouen which ordered the destruction of barberry bushes. The eminent fungologist Fries held strong views as to the specific, and even generic, differences between the barberry *Æcidium* and the wheat *Puccinia*, which necessarily gathered great weight; but De Bary, in 1860–64, proved that the æcidia of certain other forms are only stages in the life-history of species of *Uromyces* and *Puccinia*, and in 1864 he proved by sowing the teleutospores of wheat-rust on barberry leaves that this was actually the fact, and he for the first time saw the entrance of the infecting-tube and the beginning of its growth in the tissues of *Berberis*. In 1865 he demonstrated the infection of the corn by means of the æcidiospores from the barberry, which, startling as it is, is now found to be of very general occurrence in leaf fungi, and that most of the fungi formerly known as distinct species of *Æcidium* and *Puccinia* are really only two stages in the life-history of an individual species—a condition of things which the larval and image condition of insects might have prepared us for. But to De Bary, as I have said, is due the discovery of heterœcism, which suggested looking at the vegetable kingdom from a new standpoint, and which has assisted to clear up many mysteries.

Another valuable truth which has been made known is that which shows that sexuality in plants, which for long ages was known to be the privilege of the phanerogams, was proved by Hofmeister in 1851 to be a feature also possessed by all classes of cryptogams, and that therefore a quality thought to belong to flowering plants only is also owned by the more lowly unflowering forms—in fact, another proof of the unity of Nature has been

established, and we see the higher phanerogams and the lower cryptogams are not separated by an impassable abyss, but, on the contrary, that the chasm is bridged over by many connecting links. To Hofmeister is also owing the discovery of the alternation of generations in the higher plants; while Strassburger, in 1876, first observed the actual process of fertilisation. Mohl described the nitrogenous lining of the cell-wall to which he in 1846 gave the name protoplasm, that most complex and all-pervading and mysterious substance which Cohn, the veteran founder of bacteriology, in 1850 identified with the animal substance previously described by Dujardin under the name "sarcode," and thus forged another link which joins the animal and the vegetable world.

One marked change has taken place during the past century so far as

The Professional Teaching of Botany

is concerned, for in the early years of the century all the important botanical chairs in Britain were held by systematists; now not a single one is so occupied. This is not an unalloyed advantage. That systematic botany alone should be taught to the almost absolute neglect of histology or physiology was doubtless an evil, and it has been said that taxonomic teaching was choked by its own nomenclature; but the whirligig of time brings its revenges, and now at the close of the century we may without injustice retort that laboratory botany is being strangled by the exuberance of its terminology.

And the positive evil exists that with the neglect of systematic teaching in Britain our Continental and transatlantic *confrères* are occupying the ground in which Britain for long held a foremost position, and which from the extent of our Colonial possessions should be especially its own. To the pharmaceutical student the advantage of studying morphology rather than physiology is manifest, and even so far as histology is concerned the examples chosen should as far as possible be such as are connected with pharmacy.

Bacteriology

is the study of schizomycetes, as Naegeli called the plants we now know by the name bacteria. These were first discovered by Leeuwenhoek 200 years ago, and were for a long time considered to be infusorial animals, until Cohn, in 1853, pointed out that they were of vegetable origin, closely allied to fungi. Their importance was made manifest when Pasteur, in 1862, showed that certain

bacteria are employed in converting urea into ammonium carbonate, and more recently Winegradsky, in a brilliant series of experimental researches, discovered that other species oxidise the ammonia compounds into nitrites, while still other species change the nitrites into nitrates. Thus an obscure cycle in Nature has been clearly elucidated, and we are enabled to realise how the immense natural deposits of "caliche," or impure nitrate of soda, which are found in a rainless tract of country in the plain of Tamarugal, between the Andes and the coast-line of Northern Chili, have been gradually formed by the action of these minute organisms which have converted the accumulated nitrogen of the soil into these valuable deposits, which are so enormous that as much as 1,200,000 tons was exported in a single year in order to replenish the exhausted soils of another hemisphere. But it is the part which bacteria play in the causation of disease which especially interests us as pharmacists, and time fails to tell of all the triumphs of scientific work in this great subject since Pasteur, Lister, and Koch, each in a separate department of correlated inquiry, deduced important principles of treatment, which have altered, and will still further alter, our daily task as dispensers of medicine.

I have already wearied you with a sketchy account of a few of the more notable features in the progress of science during the century, and you may well demand of me, "What on earth has this to do with pharmacy?"

My answer is, I have heard so many speeches made, so many addresses delivered, and read so many columns about the decadence of pharmacy, and have been so wearied with reading clauses of Pharmacy Bills which perish before they are born, that I ventured for a while to divert attention from introspective analysis, and took the liberty of detailing some of the advances made in the higher branches of scientific inquiry. To come to those

MATTERS MORE INTIMATELY CONNECTED WITH OUR CALLING,

let us ask, and frankly try to answer, three questions: Is there a decadence in pharmacy? If so, what are the contributing causes? Is there a remedy? It is difficult to know what was the actual pecuniary condition of pharmacy at the beginning of the century, but from such information as one is able to obtain about that time, there is good reason to believe that a chemist and druggist carried on a protean-sided business, prescribing freely for many of the diseases to which flesh is heir, and for some of those which flesh acquires, acting as a dental practitioner, dealing in paints and

colours, selling veterinary preparations, and, on the whole, making a good living. In one town which I take as an example there were as many pharmacists who were making individually as large profits when the town had 20,000 inhabitants as is done now, when it has 80,000. The pharmacists of that period certainly occupied relatively a better position among their fellow tradesmen than the present ones are doing. In fact, we may say that, as compared with the sixties and seventies, the depreciation in goodwill alone among British pharmacies is at least 50 per cent. So much for the trading point of view. Doubtless, as compared with the beginning of the century, the pharmacist of to-day is a much better educated individual, and, in this respect, I am willing to concede that, as compared with his fellow tradesmen, he has not retrograded; but his income has not kept pace with theirs. If we compare the present time with the seventies and eighties, I think we must admit that the general interest in science exhibited by pharmacists shows a decided falling-off. The regrettable loss of numbers experienced by this Conference corroborates this statement. I am not disputing that excellent work is done by followers of pharmacy to-day, but I am afraid it is chiefly done by members of wholesale rather than of retail pharmacy.

I answer my first question by asking another. Must we not sorrowfully admit that retail pharmacy is less prosperous now than at any time within memory? To the second question as to the cause, many answers exist. First, there are those which are beyond our control, such as the diminution of returns, owing to the segregation of businesses and professions. The working classes, who came to the druggist during the first half of the century for advice and medicines, now to a great extent belong to provident dispensaries, many of which are very excellent institutions; others, greatly assisted by charitable doles, are simply close corporations for a few favoured medical men; others are notoriously abused in admitting as members individuals who are perfectly well able to pay both for medical attendance and for medicine. A very considerable share of business has thus been diverted from pharmacy. Nursing and convalescent homes and other pseudo-charitable institutions also contribute to this. The excellent socialistic work done by municipalities and parish councils in providing proper sanitation, in the preventive treatment in medicine, in the isolation of infectious diseases, are all factors exerting adverse influence, although we cannot grumble at them because the body politic has greatly benefited. There are, however,

Contributing Causes which are Less Legitimate.

Practically the first half of the century saw free trade in medicines and poisons. It is true the Pharmaceutical Society of Great Britain had been established, and those members of our business who had made their way, and who were not only good business men, but also men with a respect for and lovers of scientific pursuits, established a voluntary system of examination which was useful and practical, and one which *per se* was the servant and not the master, and in which a knowledge of pharmacy as a business was the first requisite. In the course of time the diploma became a valued possession, not only as to what it meant from a scientific point of view, but also as being a distinct commercial asset. It was frequently seen in shop windows. The success of this examination was recognized by our Legislature, since it passed the Bill which gave the Pharmaceutical Society power to examine and make that examination compulsory. What has been the result? A gradual divergence towards the purely scientific side in the examinations, in which the more practical part of pharmacy has been pushed to the wall. Concurrently with this has been the passing of large numbers of candidates, who appear to be so disgusted with the modicum of science which they assimilated for the purpose of passing the examination, that they forthwith drop all pretention to the name of scientists, and prefer to exist by selling their birthright as independent men, to be a qualifying dummy, ruled over by people who know nothing, or next to nothing, of pharmacy, yet can give the qualified man points in everything relating to business transactions—a symbiotic union, in which both organisms do little good to themselves and infinite harm to us. Therefore, I think our examination system and our teaching may have unconsciously assisted in the downward movement. There has also gradually grown up in certain quarters a kind of scorn for knowledge of business routine, and an undue glorification of the scientific side. Instead of the form of education so ably sketched out by Mr. Schacht in this place twenty-three years ago, it is now seriously suggested that the proper method of educating a pharmacist is to send him to college, where, having attended a certain number of compulsory lectures on botany and chemistry, he would be able quite easily to pick up sufficient practical pharmacy to qualify. This being attained, he would soon be able to acquire a business knowledge of pharmacy. Gentlemen, I think this is a disastrous suggestion. It might possibly answer in a State-protected system of pharmacy, but I venture to think that such a plan

could not succeed where the State has done much to hinder, but nothing to protect, the interests of pharmacy. In the struggle for existence how could such a one successfully compete with another trained as a draper's apprentice, for instance, in business routine, or as a pharmacist's apprentice should be, in all the practical groundwork of his trade? Now I come to another great cause of pharmaceutical decadence—namely, the growth in the

SALE OF SO-CALLED PATENT MEDICINES,

as well as those still more insidious and dangerous foes the proprietary articles used—so often, alas! ordered—in dispensing. The first were in former days sold by stationers and newspaper agents, an arrangement brought about in many cases by the advertising-agents taking the cost of advertising in kind; then, impressed with their growth, chemists unwisely made themselves the advertising medium; but the benefit was ephemeral, as, on the cutting element being introduced, patent medicines offered an opportunity which was quickly grasped. But, after all, these were open enemies; the greatest foes are those of one's own household, such as the proprietary article with which our physicians are profusely sampled, and which makes dispensing, which at one time was both pleasant and profitable, neither agreeable nor remunerative. Once pleasant, because not unseldom the prescription necessitated some call upon the intellectual faculty, and one's chemical or pharmaceutical training proved of service; now, when two pills No. 4 (Brown and Jones) are ordered, with some one else's mist. bismuthi and another person's liniment, a natural feeling of injury is experienced by the pharmacist, who having expended a considerable amount of time and money in being educated to prepare such medicaments, feels that the physician is tacitly telling him he has little confidence in his knowledge. The sending out in the original packages such medicines as I have alluded to hardly comes under the head of intelligent compounding, while pecuniarily, instead of a profit an actual loss is not infrequently incurred. But all these causes are relatively unimportant compared with the effects produced by company-trading upon pharmacy, associated as that is with the *robbery of our titles* and the suggestive inaction of the Legislature to give us proper protection by proper legislation. The Legislature called us into being and insisted that every chemist before commencing business should be qualified, and then out-gilberted Gilbert by allowing seven people, not one of them qualified, to open a chemist's business and call themselves chemists. Contrast this behaviour with that

adopted by any other civilized Government on the Continent or elsewhere. Compare it with Germany, our most powerful rival in applied chemistry, and there we shall find a very complete protection is given to the pharmacist, and an even more generous treatment is offered in Russia; but from one reason or another—possibly from the bugbear of "departing from the principles of free trade," or, perhaps, a too jealous care of vested interests which have been built up on a piratical basis—the law-making assemblies of this country stand by and see a gigantic injustice done to a body of men, which it is their duty to see receive a just protection.

Is There a Remedy

for the bad times we are enduring? Something can be done by the Legislature, and that something should be asked for with no faltering voice, with no divided counsels, with no uncertain sound, and with no further delay. But the greater part of the problem must be left to ourselves. The battle is to be won by pitting our own exertions and our individual industry against the advantages of large capital, of great purchasing powers, and other premiums which companies possess. We shall have to rely upon ourselves—upon the fact that when a man works for himself he works for a hard taskmaster, who is satisfied with no slackness of effort, but one who demands the fullest employment of every faculty—and if this be given, the competition of a hydra-headed company should not be a too successful rival. The history of limited liability companies in Britain during the past twenty years should offer some consolation, notwithstanding the enormous amount of capital which has been invested in them, for if the price at which they were floated is put against that at which they stand to-day, it will be found there is a very great diminution, even without taking into account the large number of those which, unhonoured and unsung, have melted into thin air.

In Ireland there is a brighter outlook, since to a considerable extent you have wrought out your own salvation; it remains for us to see that the members of this Conference, which has done so much to foster the interests and the highest aims of scientific pharmacy—this Conference, which has been and is the means of forming pleasant friendships, or of cementing and preserving old ones, and which has always advocated a high standard of mental discipline—should in no way fall short of the ideal sketched out in this city twenty-three years ago, but that not only the Conference in its corporate capacity, but each member of it individually,

shall, with whatever talent he may have been blessed or with any faculty he may have acquired, strive to the utmost to defend the gage which he threw down when he entered the service, hard and unrequiting though it be, but a service which is no ignoble one, that of our common mistress—Pharmacy.

Mr. N. H. Martin proposed that the thanks of the meeting of members of the Conference and of pharmacists throughout the world be given to the President for his very learned, comprehensive, and interesting address. He would not spoil the effect of that address by many words of his own, but, with it ringing in his ears, he ventured to hint that Mr. Druce was himself a living contradiction of the suggestion that there was something in pharmacy which tended to limit the mental horizon of those who practised it. He felt proud to know that that address would be enshrined in the *Year-Book of Pharmacy*. Perhaps no predecessor of Mr. Druce had had the opportunity of doing what he had done, inasmuch as science was advancing year by year, and lately by leaps and bounds; but he ventured to say that no other man could have dealt with the subject in the masterly manner he had done. It had been his good fortune within eight days—in Glasgow last week and now to-day—to listen to two addresses from men who commenced life as pharmacists, and still retained their connection with it; and anything more comprehensive, more thorough, than the consummate knowledge of the subjects with which they dealt, he never met with. He had said, on more than one occasion, that there was something in pharmacy which was calculated to arouse intelligent curiosity and call forth the highest mental effort. The President was certainly an instance of one who had made the very best use of his opportunities; he was not only intimately acquainted with the sciences on which pharmacy is based, but was capable of giving a very wide and interesting *résumé* of other sciences. When he turned aside for a few minutes to geology, he could hardly help wishing that he might forget the address altogether, and give them half an hour on that delightful subject. Those who were at Oxford heard the President deliver an impromptu address on botany, and although he did not mention his own name in connection with systematic botany, they all knew how much he had contributed to the knowledge of local botany in his country. He felt sure that pharmacists throughout the world, when they read this address, would join in the vote of thanks he now had the pleasure of moving.

Mr. ROBINSON seconded the motion. He said they were to be congratulated on listening to an address which covered so wide a field. That was not the time to enter fully on some of the points touched upon by their President. He was struck by the fact that the President said liquid medicines had been superseded largely by tabloids; but he observed on the previous day at Messrs. Guinness's that stress was laid on the fact that it required more pharmaceutical skill and knowledge to produce a beverage than it did to produce a solvent. It might be that, if in the future there was no longer any demand for liquid medicines, there would be liquid preparations which they might prepare and sell to the public to be taken regularly during the day at stated intervals.

Dr. ATTFIELD, speaking as the oldest past-President attending that assembly, supported the vote of thanks, and put it to the meeting. He had listened to many presidential addresses, and hitherto had thought none more interesting than an address which reviewed a past year or a past decade. Mr. Druce had, however, given them a review of the advancements in science that had been made during the past century. Nothing could be more interesting to pharmacists, inasmuch as pharmacy included applications of several sciences, and it at least touched on several more. The President, at this thirty-ninth meeting, had not only delivered to them such an address, but had done so with a thoroughness and a finish that had instructed and charmed them.

The resolution was then carried amid prolonged applause.

The PRESIDENT, in responding, expressed the great satisfaction and pleasure it was to him to see present that day Dr. Attfield, who was Secretary of the Conference when it last met in Dublin. They all knew how much he had done for both chemistry and pharmacy, and, in fact, how he had made pharmaceutical chemistry a possibility. He was glad to say that there were three gentlemen present from Greater Britain, viz., Mr. Baker, from Calcutta; Mr. Ingram, from Johannesburg; and Mr. Moore, from India, and he was sure the Conference would give them a hearty welcome.

Mr. INGRAM thanked the members for the reception given to colonial representatives. It was the first time he had attended the Conference, and it had given him very great pleasure to be present. They had had a very exciting and difficult time in South Africa during the past two years, but they had stood by one another, and he was very glad to say they had been able to fully rely on the friendship they had for one another as pharmacists during a very troublous period.

Mr. BAKER also thanked the Conference very heartily for the good wishes towards them expressed by the President. It was the first Conference he had attended—he hoped it would not be the last. There were not a very large body of chemists in India, but they had not to contend with the Poisons Act, he was glad to say. It had afforded him great pleasure to be present to hear the President's address, and he thought it was worth coming all the way from Calcutta to hear.

LETTERS OF APOLOGY FOR ABSENCE.

Mr. NAYLOR (Hon. Sec.) said he had received letters from several gentlemen who were unable to be present, expressing their good wishes for the Conference. He would not detain the meeting by reading them, but would only say they came from Mr. Atkins, Mr. Cross, Mr. John Moss, Mr. E. M. Holmes, Mr. Leo Atkinson, Mr. Farr (Uckfield), Mr. Martindale, Mr. Peter Boa, Mr. Wright (Buxton), Mr. Wippell Gadd, Mr. Cripps, Mr. Collier, Mr. C. B. Allen (Vice-President of the Pharmaceutical Society), and Mr. Louis Siebold, who sent a message of cheer from his sick-bed.

The PRESIDENT said he had also received letters of regret from the President of the Pharmaceutical Society, Mr. Branson, of Leeds, and many other gentlemen.

RECEPTION OF DELEGATES.

Mr. W. A. H. Naylor (Hon. General Secretary) read the following list of delegates to the meeting :—

British Pharmaceutical Conference Delegates to Dublin Meeting, 1901.

Pharmaceutical Society of Great Britain :—The President, Vice-President, Messrs. Cooper, Cross, Glyn-Jones, Harrington, Park, Symes and the Secretary.

Pharmaceutical Society of Great Britain, North British Branch :—Mr. Peter Boa (Chairman), Mr. Doig (Vice-Chairman), Messrs. W. B. Cowie, W. L. Currie, J. Johnston, C. Kerr, Thos. Maben, R. McAdam, Alex. Spence.

Pharmaceutical Society of Ireland :—Mr. Beggs (President), Mr. Bernard (Vice-President), Mr. Grindley (Treasurer), Professor Tichborne, Messrs. P. Kelly, W. F. Wells, and R. Simpson.

Belfast. Chemists' and Druggists' Society of Ireland :—Messrs. W. J. Gibson, W. J. Rankin, and John Watson.

Bradford and District Chemists' Association :—Messrs. R. W. Silson and A. Hanson.

Bristol Pharmaceutical Association :—Messrs. T. Buxton and J. Chandler.

Cambridge Pharmaceutical Association :—Mr. E. Saville Peck, M.A.

Edinburgh Chemists' Assistants' and Apprentices' Association :—Messrs. W. B. Cowie, W. Duncan, and J. Rutherford Hill.

Exeter Chemists' Association :—Messrs. J. Hinton Lake and Henry Gadd, J.P.

Forfarshire and District Chemists' Association :—Messrs. A. Naysmith (Arbroath), A. B. Anderson, Wm. Cummings, Chas. Kerr (Dundee), John Anderson, James Russell, and Wm. Ramsay.

Glasgow and West of Scotland Pharmaceutical Association :—Messrs. W. L. Currie, John McMillan, John Foster, Geo. Robertson, Robert Brodie, J. McMurray, and Thomas Maben.

Liverpool Chemists' Association :—Messrs. J. Alexander, J. Bain, Cowley, E. Evans, junr., J. H. Evans, Prosper H. Marsden, J. J. Smith, J. H. Swinton, Symes, Wardleworth.

London Chemists' Assistants' Association :—Messrs. W. Garsed and E. J. Strother.

Western Chemists' Association :—Messrs. Bowen, Harrington, J. H. Mathews, and W. P. Robinson.

Manchester Pharmaceutical Association :—Messrs. Johnston, Kemp, Kirkby, and Pidd.

Midland Pharmaceutical Association :—Messrs. J. Poole, F. J. Gibson, and Chas. Thompson.

Newcastle-on-Tyne and District Chemists' Association :—Mr. Chas. Ridley (President), Messrs. Clague, Foggin, Gilderdale, Merson, Pescod, and Rose.

Nottingham and Notts' Chemists' Association :—Mr. A. Russell Bennet.

Oxford and District Chemists' Association :—Mr. G. C. Druce, M.A., and Mr. H. Mathews.

Plymouth, Devonport, Stonehouse, and District Chemists' Association :—Messrs. Barge, Hunt, Maitland, Nursan, and Park.

Sheffield Pharmaceutical and Chemical Society :—Messrs. A. R. Fox, F.L.S., T. W. Newsholme, F.C.S., and G. Squire.

Swansea and District Chemists' Association :—Messrs. J. T. Davies and J. Hughes.

Tunbridge Wells and District Chemists' Association :—Mr. A. E. Hobbs.

Wigan Chemists' Association :—Mr. Phillips.

Wolverhampton and District Chemists' Association :—Mr. F. J. Gibson.

Report of the Executive Committee.

Mr. F. Ransom (Hon. Gen. Secretary) then read the following :—

The present report covers the thirty-eighth year of the existence of the Conference, and while the general meetings continue to be most successful, both in attendance and interest, your committee regrets that the effective membership is still a source of anxiety. The number of new members elected during the past year has been fifty-seven, while the removals by death have amounted to sixteen, the resignations to forty-five, and fourteen names have been removed owing to subscriptions being four years in arrear. Special efforts have been made during the year to prevent this lapse of membership, the senior Honorary Secretary having addressed a personal letter to each member whose subscription was in arrear. The result has been satisfactory, in so far as the deletions have been eighty less than last year, but owing to the smaller number of elections, the total membership is not greater than a year ago.

The Research List has been revised by a sub-committee appointed by the Executive, and, by the courtesy of the respective editors, has again been published in full in the principal journals connected with pharmacy in this country. By the kindness of Dr. Attfield several subjects were introduced into the list which had been suggested by him as suitable for investigation in his Pharmacopœia Report for 1898.

It is with the profoundest regret that your Committee has to record the resignation, on account of ill-health, of Mr. Louis Siebold, F.I.C., F.C.S., as editor of the *Year-Book*, a position he has filled with the greatest advantage to the Conference for the unprecedented period of twenty-seven years. In accepting his enforced resignation, your Committee placed on record its sense of the great ability, unflagging zeal, and wise discretion with which he has discharged his onerous duties, tendered to him its warmest thanks for his valuable services, and expressed its sympathy with him in his affliction.

Mr. J. O. Braithwaite has been appointed editor of the *Year-Book* for the current year, and he reports that the MSS. of Parts 1 to 3 are in a forward state, and will be in the hands of the printers next week.

Reference was made in the last report to a proposal to create a fund for the maintenance of a research worker. There were found to be difficulties in carrying out the suggestions as originally intended, but a special fund amounting to forty-five guineas for the present year has now been raised, which is available for grants in aid of research. Gentlemen desiring to avail themselves of this fund are invited to apply to the Executive Committee. The Treasurer has opened a separate account at the Bank under the title of the British Pharmaceutical Conference Research Fund, and it is hoped that the capital sum will be further increased by donations from time to time from other members who approve its object and desire its success. A new edition of the B.P.C. Formulary has been prepared since the last annual meeting, and a report will be presented by Mr. Martin, the Chairman of the Committee.

With deep regret your Committee has learnt from Mr. W. A. H. Naylor, the senior Honorary Secretary, that owing to indifferent health and increasing claims of business he is unwilling to be nominated again for the post he has occupied with such conspicuous ability during the past fifteen years. The extreme value of the services rendered to the Conference by Mr. Naylor during this period can only be fully appreciated by those who have worked with him on the Executive, but the serious loss to the Conference involved in the resignation of so able an official will be apparent to all members.

The death roll includes the names of two distinguished honorary members of the Conference, Dr. E. R. Squibb, of Brooklyn, whose scientific researches had long placed him in the front rank of pharmacy, and Dr. Rice, of New York, the able Chairman of the Committee of Revision of the United States Pharmacopœia.

Sir Thos. Robinson moved the adoption of the report. He had been a member of the Conference for many years, but, unfortunately, he had not been able to attend on any previous occasion. He hoped it would be many years, if he were spared, before he omitted again to attend. Pharmacy had made a great advance in Ireland since the last visit of the Conference to Dublin, and he was perfectly satisfied that now the pharmacists of that country had had the opportunity of intermingling with their brethren on the other side, the Conference might look for a great accession of members. He was sorry to hear that there was a prospect of Mr. Naylor retiring from the position he had so ably filled for many years. He was sure that he would be expressing the unanimous

wish of the members if he asked him to reconsider his determination.

Mr. EDWARD EVANS seconded the motion, and joined with Sir Thomas in the hope that there would be no change in their Secretaries. The report was a very favourable one, and he was quite certain that the Conference would succeed more and more every year. They had heard that day an address of a most practical character; it was an address which showed how scientific knowledge could be blended with business ability.

THE FINANCIAL STATEMENT.

The TREASURER (Mr. John Umney) said the financial statement was this year of an especially favourable character. The subscriptions this year amounted to £406, against £370 and £353 in the two previous years. The total arrears were only £48, and in reality only about £20. Since the statement was made out about £14 had been received in subscriptions from abroad, and had it not been for the extra expenditure on the *Year-Book* there would have been a balance in hand. That extra expenditure for the preparation of the very useful reference tables would not recur, and there would also be a saving in the matter of the editor's salary, and other ways. He had no doubt, therefore, that even if there were no accession of members, their position next year would be much improved, and he hoped that they would be absolutely out of debt. There was a slight accumulation in the Bell and Hills Fund account, owing to the fact that last year there was no presentation of books. There had been no application for a grant from the Research Fund, which now amounted to £47 5*s*.

Financial Statement for the year ending June 30th, 1901.

The Hon. Treasurer in Account with the British Pharmaceutical Conference.

1900.	Dr.	£ s. d.	£ s. d.
July 1.	To Assets forward from last year :—		
	„ Cash in Secretary's hands—		
	Petty Cash	1 8 1	
	Postages	1 14 6	
	„ Cash at Bank	114 0 11	
			117 3 6
1901.	„ Sales of *Year-Book*—		
	By Publishers		14 13 4
	„ Advertisements, 1900 vol.		62 3 2
	„ Sales of Formulary—		
	By Publishers	46 9 4	
	By Secretary	0 18 0	
			47 7 4
	„ Members' Subscriptions		406 2 4
	„ Liabilities on open Accounts :—		
	Butler & Tanner . . .	121 12 6	
	McCorquodale & Co. . . .	2 4 0	
	Assistant-Secretary's Salary and Rent, from April 1 to June 30	13 15 0	
			137 11 6
	„ Bell and Hills Fund		28 11 9
			£813 12 11

1901.	Cr.	£ s. d.	£ s. d.
June 30.	By Expenses of *Year-Book*, 1900 :—		
	Printing, Publishing and Binding	230 2 6	
	Banding and Parcelling . .	1 10 0	
	Postage and Distributing .	8 0 5	
	Advertising, Publisher's Charges, and Commission .	16 9 10	
	Editor's Salary . . .	150 0 0	
			406 2 9
	„ Formulary :—		
	Publishers' Charges, Vol. 1900	0 0 11	
	Ditto Charges and Commission, 1901	4 13 6	
	Advertising	5 17 6	
			10 11 11
	„ Sundry Expenses :—		
	Ash & Co. 600 Prospectuses .	1 16 0	
	Assistant-Secretary at Annual Meeting . . .	10 0 0	
			11 16 0

1901.	Cr.	£ s. d.	£ s. d.
June 30.	By Assistant-Secretary's Salary :—		
	From July 1, 1900, to June 30, 1901	45 0 0	
	Rent of Office . . .	10 0 0	
			55 0 0
	„ Postages	17 6 11	
	„ Printing and Stationery :—		
	McCorquodale & Co. . .	5 9 0	
			22 15 11
	„ Petty Cash expended . .	3 8 10	
	„ Bank Charges, 1*d.*, 3*d.*, less P.O. and Check Book, 4*s.* 2*d.*	0 4 5	
			3 13 3
	„ Liabilities of last year, since paid :—		
	Butler & Tanner. . .	150 10 9	
	Ditto	16 5 11	
	McCorquodale & Co. . .	5 3 0	
			171 19 8
	„ Assistant-Secretary's Salary and Rent .		13 15 0
	„ Assets on open account, J. & A. Churchill		96 4 1
	„ Cash in hands of Secretary .	3 4 4	
	At Bank (as Pass Book) .	18 10 0	
			21 14 4
			£813 12 11

The Bell and Hills Fund.

1900.		£ s. d.	£ s. d.
July 1.	To Balance on hand . . .	19 3 5	
1901.			
June 30.	„ One Year's Dividend on Consuls	9 8 4	
			28 11 9
	„ Assets :—		
	In account with British Pharmaceutical Conference .	28 11 9	
	£360 2¾% Consolidated Stock	360 0 0	

The British Pharmaceutical Conference Research Fund.

1901.		£ s. d.
June 7.	To Donations	47 5 0

Examined and found correct,

July 18, 1901, JNO. H. MATHEWS.
July 23, 1901, G. H. GRINDLEY.

July, 1901.

The Financial Report and the Report of the Executive Committee were then unanimously adopted.

Report of the Formulary Committee.

Mr. N. H. Martin then read the following report: "Since the last Annual Meeting of the Conference the Formulary Committee has, with the consent of the Executive, published the formulary which it was anticipated would be ready towards the close of last year. Owing to various circumstances, but chiefly to the desire of every member of the Committee to thoroughly test each formula, the publication was delayed until March of the present year, when it was issued in the form which the Committee hopes is familiar to all the members. The additions and alterations are all set forth in the preface to the book. The present edition of the Formulary has been received on all sides with such favourable criticism that it would seem to indicate that it supplies an actual want in pharmacy. If it is the pleasure of the Conference to reappoint the Committee there is much work to be done to make the Formulary as complete as was contemplated when the Committee was first appointed. The Committee will be glad if all members of the Conference will interest themselves towards this end by indicating to the Secretary any shortcomings they may have observed in the present edition, and especially if they will send in the names of all preparations which may occur frequently in prescriptions, but for which there is at present no authorised formula in the Pharmacopœia or the Formulary. It is only by such assistance from all the members of the Conference that the Formulary Committee will be able to obtain its maximum of usefulness."

The reading of papers communicated to the Conference was then proceeded with, the first paper read being on

THE PHARMACOPŒIAL REQUIREMENTS FOR JALAP.

By John C. Umney, F.C.S.

So much has been written during the past generation on the subject of this drug that it seems hardly necessary to review in detail past literature relating to it. Opinions, however, appear to be unanimous that jalap tubers may vary enormously in the percentage of resin that they contain. *Pharmacographia* (edition

1874, page 400) records an examination of jalap tubers by Charles Umney, containing 21·5 per cent. of resin, and also one by Widnmann of the root cultivated at Munich, containing 22 per cent. of resin. These percentages are higher probably than those met with in commerce, and higher than any examinations recorded in the papers by Squibb (*Pharm. Journ.* [3], xviii. 1,067), Barclay (*Pharm. Journ.* [2], ix. 166), and Warden (*Pharm. Journ.* [3], xviii. 129).

Two of the most recent examinations of trade samples of jalap are those recorded by C. E. Robinson, who found (*Pharm. Journ.* 1893, p. 531) that the ten samples he examined varied between 7·5 and 17·7 per cent. of resin (averaging 12 per cent.), and Cripps (*Pharm. Journ.* [3], xix. 422), who examined thirty-four samples varying from 5·8 to 15·6 per cent. of resin and averaging 9·8 per cent.

It must not be overlooked, however, that the samples examined by Robinson were from open pharmacies, and had therefore presumably passed through the hands of wholesale druggists, who doubtless in the exercise of their judgment had rejected many samples of the drug having a low assay of resin. Nationalities seem to have adopted widely varying standards—the standard proportion of resin required in the recently published Pharmacopœias being as under :—

		Percentage of Resin.
British Pharmacopœia,	1885	10.
" "	1898	9 to 11.
U.S. "	1880	12.
" "	1890	12.
German "	1890	7.
" "	1900	9.
French Codex,	1884	16 to 18.

Whilst there can be no question that the standard of the German Pharmacopœia, 1890, was too low, that of the French Codex is exceptionally high, and so high indeed that a jalap of such a resinous assay is rarely obtainable.

In his report to the General Medical Council for the year 1888 Dr. Attfield said :—"Clearly the proportion of resin yielded by jalap has for the past twenty years been gradually diminishing." Whether that be entirely true or not, at any rate during the last few months it has been extremely difficult to find any jalap on the London market containing a high percentage of resin or, for the matter of that, a proportion even up to the minimum of the British

Pharmacopœia. In consequence I have thought it desirable to collect such samples as may be practically said to represent the bulk in trade in this country, with a view to determining how far the drug falls short of Pharmacopœial requirements, and, if possible, to account for the deterioration.

Flückiger (*Year-Book*, 1890, p. 146) has suggested that the resin is partially extracted from the jalap tubers in Mexico. I understand from one of the oldest drug brokers in London, who has handled jalap very largely for the last half century or more, that the tubers are collected at practically any time during the dry seasons, from the middle of November to March.

Very little care appears to be taken either in the cultivation or in the selection of tubers for collection. David Hooper (*Pharm. Journ.*, July 11, 1896, p. 21) recorded most interesting results regarding the cultivation of jalap in the Government cinchona plantations at Dodabetta, Nilgiris, India, and the effect of phosphatic manures on the resin percentage. It might be inferred from Hooper's investigations that the percentage of resin may be increased by one-half by special attention to the question of manuring and careful cultivation.

Out of thirteen samples that I recently had the opportunity of examining, the results of which are subjoined, it will be seen that only two samples are in excess of the maximum Pharmacopœial requirements, whilst the lowest recorded only contains 5·4 per cent. of resin.

PERCENTAGE OF WASHED RESIN.

No. 1.	6·0	per cent.
„ 2.	8·2	„
„ 3.	8·0	„
„ 4.	6·7	„
„ 5.	8·7	„
„ 6.	5·4	„
„ 7.	11·3	„
„ 8.	6·2	„
„ 9.	18·4	„
„ 10.	9·6	„
„ 11.	7·3	„
„ 12.	6·4	„
„ 13.	6·5	„
Average	8·3	

How then is the deterioration to be accounted for? By one or two theories—either by supposing that maturity, period of collec-

tion, and soil materially effect the percentage of resin, or that the root has been subjected to the treatment suggested by Flückiger referred to.

I have been able to obtain a supply of tubers that only yielded 5·4 per cent. of resin, but examination of these fails to show that they have been treated by any solvent. They are exceedingly small, with pale exterior, starchy, and obviously immature; the tubers yielding 18·4 per cent. of resin are large, have dark exteriors, and in many instances have been sliced for drying and are much shrivelled.

I have not been able to determine that there is any considerable difference or any direct ratio, inverse or otherwise, between the proportion of starch, saccharine matter, and resin contained in the various powders examined.

Tincture of Jalap.

The tincture is in very little demand, but it will be obvious that for the tincture to contain the proportion of resin required by the British Pharmacopœia, 1898, namely, 1·5 Gm. of resin per 100 c.c., it will differ enormously in extractive according as it has been prepared from root strong or deficient in resin. In my experience the average yield of total extractive of jalap root to 90 per cent. alcohol is about 16 per cent., although, in the case of the root yielding 18·4 per cent., the percentage yielded to 90 per cent. alcohol was as high as 25·3, and to 70 per cent. alcohol 30·9. Tinctures prepared with 70 per cent. alcohol from jalap containing approximately the quantity of resin required by the British Pharmacopœia contained about 2·3 to 2·7 Gm. of extractive per 100 c.c. I have examined samples obtained from various sources, and the following yields of extractive have been obtained from tinctures of the same resin strength:—2·9 Gm. from 100 c.c., 3·4 Gm. from 100 c.c., 3·5 Gm. from 100 c.c., 3·8 Gm. from 100 c.c., 3·7 Gm. from 100 c.c., 2·8 Gm. from 100 c.c.

In conclusion, I hope that efforts will be made to improve the conditions under which the cultivation and collection of jalap are carried on, so that the standard of the British Pharmacopœia, 1898, which does not appear to be unreasonably high, may be if possible maintained.

Dr. Attfield was quite sure that the compilers of the current Pharmacopœia would be glad to receive Mr. Umney's opinion, and that they would agree that the percentage might be maintained.

Between now and the publication of the next Pharmacopœia it should not be difficult to ascertain if the tubers were becoming exhausted, naturally or artificially or both, and if so, whether means could not be taken to stop the exhaustion. That would be preferable to a reduction of the present official standard. It was quite possible that not only the tincture but also jalap itself would be far less used than formerly, the resin or its solution taking their place; but still, while there was any official recognition of the tuber the question of the percentage of its resin should be thoroughly investigated.

Mr. Ransom corroborated Mr. Umney's observations as to the present difficulty of getting jalap of B.P. standard. His laboratory-books showed that the amount varies from 8 to 13 per cent. of resin, latterly 8 per cent. being the highest, although all through 10 per cent. was almost exactly the average.

Mr. Brodie said the question was whether the active properties lay in the resin or in the extractive.

Dr. Symes thought the paper showed that the Pharmacopœia was reasonable in requiring a percentage of 9 to 11 per cent., and that it was possible that such could be maintained by proper manuring, etc. The paper was valuable, not only to the pharmacist, but also to the growers of jalap, who might be required to bring it up to the Pharmacopœia standard, which had been shown by the paper to be reasonable.

Mr. Cowley said the great variations in the amount of extractive matter referred to by Mr. Umney showed that standardisation in itself was not of so much value. It was easy to make up the quantity of resin in a tincture, or the amount of alkaloid, and he did not know that there was any possible means of ascertaining whether the alkaloid was the added or the natural alkaloid of the drug, and the same with regard to the resin; but, taken conjointly with the amount of extractive matter, there was a possibility of finding an opening out of the difficulty. Similarly the total extractive matter was not of so much value, but when taken in conjunction with the amount of alkaloid or resin it might be of great assistance to them.

Dr. McWalter thought Mr. Umney had demonstrated very clearly that the requirements as to the total amount of resin were altogether in excess of what might reasonably be expected. He was a little surprised that Mr. Umney, with his vast knowledge of the drug trade, should seriously suggest that growers of jalap should pay more attention to its cultivation, considering the low

price now paid for it. It was well known that since compound liquorice powder had come into vogue jalap had almost gone out of court. Of the different samples referred to by Mr. Umney only one would pass muster if a public analyst were to make an analysis. He thought it would be well if the Committee which was going to revise the next Pharmacopœia would reduce the standard.

Mr. MARTIN deprecated the authorities reducing standards to meet the price of drugs in the market. Drugs should be collected at the time of maximum activity, and the point of the paper was that carelessness at the source of supply was the cause of the trouble. He knew nothing about the local conditions of labour or cultivation, but all drugs should be collected at the proper time, and preserved with the greatest care.

Mr. PETER MACEWAN said it was quite a mistake to assume that jalap was decreasing in consumption generally. The exports from Mexico and imports into London and New York showed conclusively that the consumption is rather on the increase. He was quite aware that locally its use had gone down, but the fact remained that the total consumption is larger. It was a mistake to assert that new remedies had squeezed out the old-fashioned drugs. This decrease in the recent percentage of resin in jalap had followed a rather prolonged period of depression in the market, so far as prices are concerned, and he thought as soon as the collectors were assured that they would get a few more pence per pound for it, that the quality would be improved.

Dr. ATTFIELD suggested that the increased imports of jalap might be for the sake of extracting the increasingly used resin.

Mr. MACEWAN said he had no information as to the use to which the drug was applied.

Mr. PAYNE (Belfast) said his observations agreed with Dr. McWalter's that jalap was much less used than formerly. It was scarcely ever ordered now.

Mr. HOWIE remarked that very large quantities of jalap had of late been shipped to India, and that might account for the increased importation referred to. His own experience was that it was not increasing in ordinary use.

Mr. PHILLIPS thought Dr. Attfield's suggestion really explained the difference of opinion. The resin of jalap was used in making many of the proprietary medicines, liver pills, and so on, but in retail practice the use of jalap was decreasing. As a family medicine it had almost gone out of use.

The PRESIDENT thought there was no doubt that the use of jalap in prescriptions and its retail sale over the counter were decreasing, but an enormous number of "patent" medicines contained it. About 50 per cent. of the common antibilious pills were made up with jalap powder. He knew of one place where at one time 5 cwts. were made at once. A public analyst had declared that a castor oil pill contained no castor oil, but that it contained a certain amount of gamboge and of aloes; but he failed to find the 50 per cent. of jalap which was present.

Mr. JOHN UMNEY, in reply, said he assumed that the resin was accepted as the active constituent of jalap from the fact that the Pharmacopœia required a certain percentage of resin as a standard. Whether it was the sole active constituent he had no knowledge, and he could not speak as Dr. McWalter did—from a medical point of view. The objection to standardisation did not apply to jalap as it did to some other things. Tinctures were often made from jalap which did not answer the official requirements, and they were standardised to the correct resin strength. The difficulty did not occur which occurred in the case of cinchona, or in cases where there were bottom and top limits of the drug to be used for galenical preparations. That had been the difficulty with the belladonna preparations of the new Pharmacopœia. He had called attention to the matter because he found that they were practically all selling a jalap which might at any moment cause trouble if the inspector fancied it was a better article to deal with than sweet spirit of nitre or camphorated oil. A deficiency of 40 per cent. appeared rather more important than some which had been suggested for prosecution. The sample containing 18·4 per cent. was an abnormal one, but they could certainly obtain samples, if they were collected at the proper time of year, which yielded more than 9 per cent. He regretted to find that Dr. McWalter took the opposite view. The German Pharmacopœia, recently published, raised the standard from 7 per cent. to 9 per cent. It was recognised that such an article could be obtained if only the trouble were taken to get it.

The PRESIDENT said they would all agree in thanking Mr. Umney for this practical paper.

The next paper was read by Mr. W. A. H. NAYLOR on :—

THE OFFICIAL METHOD FOR THE DETERMINATION OF "LIQUOR HYDROGENII PEROXIDI."

BY W. A. H. NAYLOR, F.I.C., AND C. S. DYER.

The accuracy of the official method of assaying solutions of peroxide of hydrogen has recently been questioned by different observers; the results are said to be unreliable and discordant.

A paper by C. E. Smith (*Year-Book*, 1898, p. 106) in *Amer. Journ. Pharm.*, 1898, records a series of parallel estimations by most of the usual processes except Mason's bichromate method (*Chem. and Drugg.*, 1881, p. 56); and the author concludes that the most accurate method is that of Kingzett; that all gasometric methods are tedious and unreliable, and that the permanganate especially is practically useless.

Smith shows the disturbing effects of glycerin and other preservatives on the different results, but, apart from the presence of the preservatives, he does not explain what the inaccuracy of the gasometric permanganate method is due to.

Other critics and objectors, so far as we are aware, have also abstained from explaining the cause of its alleged unreliability.

The explanation of the point is the excuse for this communication, as otherwise, and apart from the comparison of Mason's with other methods, C. E. Smith's excellent paper practically exhausts the subject.

The volume of gas obtained in the estimation of a substance by a gasometric method is, of course, affected by the conditions of temperature and atmospheric pressure which prevail at the time of the experiment. In the case in question—the estimation of solution of peroxide of hydrogen—it is essential that the effect of these conditions should be taken into account, for the Pharmacopœia expressly states that the quantity of gas evolved is to be calculated at normal temperature and pressure. In the experiments which we have conducted, therefore, corrections have been made for temperature and pressure, taking into account also the "tension of aqueous vapour."

There is, however, a feature of the reaction apart from the influence of temperature and pressure which may largely explain the observed discrepancies. If the nose is applied to the oxygen evolved during an estimation by the B. P. process, a very strong odour of chlorine will be noticed. There is nothing surprising

about this when it is considered that sulphuric acid added to the brine in the nitrometer naturally liberates a little hydrochloric acid, and this, in the presence of permanganate of potassium, becomes to some extent decomposed into chlorine; it is *the uncertainty as to the extent to which this chlorine is absorbed* by the water which renders the accuracy of the method doubtful. To get some idea of the extent to which absorption is likely to occur, we ran 12 c.c. of the permanganate reaction mixture (about the amount usually used for an estimation) into a brine-charged nitrometer, but omitted the peroxide of hydrogen, when the evolution of gas unabsorbed by the water amounted to

0·2 c.c. after five minutes.
1·0 c.c. after one hour.
1·8 c.c. after five hours.

This experiment shows that liberation of chlorine more than sufficient to saturate the liquid actually takes place.

As further proof of this 1 c.c. of 11 volume hydrogen peroxide solution was placed in a nitrometer with brine, and 12 c.c. of the acid permanganate solution were run in. When the evolution of gas ceased it measured 23 c.c., and it was then slowly passed through an acid solution of potassium iodide. At first nothing noticeable occurred, the gas in the upper part of the tube, which apart from diffusion is, of course, that liberated in the earliest stage of the action, being comparatively pure; but as the lower layers of gas bubbled through the iodide solution, progressive evidence was afforded of the presence of chlorine by the increasing liberation of iodine. When all the gas had been made to bubble through the solution, the liberated iodine was titrated with volumetric thiosulphate solution, and required 8 c.c., which is equivalent to 0·0029 Gm. of chlorine, or nearly 1 c.c. by volume.

The operation was conducted without any prolonged standing, and shows conclusively that the chlorine is most quickly produced in the presence of the peroxide of hydrogen. The proportions of solution of peroxide of hydrogen, and of permanganate solution, are those recommended by the British Pharmacopœia, and the fact that chlorine is evolved with the oxygen in uncertain quantity, and with uncertain absorption, is enough to condemn the official process as it stands.

There is no doubt that the volumetric process of Kingzett is accurate, which consists in adding sulphuric acid and potassium iodide to the solution of the peroxide, and then titrating the

liberated iodine by thiosulphate of sodium; but if a gasometric process be preferred, there are two or three alternatives in the question of details which will make it fairly satisfactory.

In the first place, to keep as nearly as possible to the official method, we tried that process without the use of brine.

Mercury works well, but the use of a rather large stock of this element, and the time required in subsequent cleaning, is rather against its use in a general way by pharmacists.

Next there is the alternative of using saturated solution of non-haloid salts. Sulphate of sodium was tried, but a saturated solution of this is not of high enough specific gravity to prevent the reaction mixture from spreading too much down the tube; this naturally dilutes it considerably, and not only delays the action, but causes a greater absorption of oxygen by the water, and the results so obtained are slightly low.

Sulphate of magnesium being far more soluble, a solution of sufficient density can easily be made, and, as a saturated solution is very probably a stock article in most pharmacies, it would be nearly always available. The assay over this liquid is rapid, and, we believe, as accurate as any gasometric can be.

Then there is the bichromate of potassium process which Mason used over mercury; we have found it to answer equally well with brine, no chlorine being given off. The evolution of gas is much slower when this "bichromate method" is used than when the official process is employed, and the oxygen obtained represents *the volume of oxygen available, not* double the volume.

The bichromate solution used was that described in the B. P. as "Volumetric Solution of Potassium Bichromate;" the solution must not be made acid, as in the presence of acid the evolution of gas is increased, and the results obtained are discordant.

We find that the use of permanganate and acid solution results always in the production of a larger volume of gas from a given volume of "peroxide" solution than is obtained when solution of bichromate is employed.

The practical objection to the B.P. method as it stands is that an article may be supplied commercially which will just pass the official limits when assayed by that process, and yet be actually under the required strength.

We append in tabular form the results of our experiments, and if a gasometric process is insisted on, we recommend the adoption of the bichromate method.

The figures represent the number of cubic centimetres of oxygen

obtained from one cubic centimetre of solution of peroxide of hydrogen. The volume of gas has in each case been corrected for temperature and pressure, and allowance has been made for the tension of aqueous vapour at the temperature at which the gas was measured.

With Acid Permanganate over Mercury.	With Acid Permanganate over Saturated $MgSo_4$ Sol.	With Acid Permanganate over Brine (Official).
8·4	8·2	10·35
8·4	8·3	10·3
8·45	8·45	—
8·5	8·5	—
8·4	—	—
8·45	—	—

With Bichromate over Mercury.	With Bichromate over Saturated $MgSO_4$ Sol.	With Bichromate over Brine.
7·65	7·7	7·7
—	—	7·7
7·25	7·4	7·6

Reference to the above table shows that the use of brine in the nitrometer, as officially directed, gives a result which is considerably higher than that obtained when mercury is used—that is, in the case of estimations by the permanganate method—while the results obtained when a saturated solution of magnesium sulphate is employed are fairly concordant with those obtained over mercury.

The figures obtained by the bichromate method of assay are in fairly close agreement whether brine or saturated magnesium sulphate solution is used in place of mercury.

We have already pointed out the fact, which is brought into notice by the above tables, that estimation by the permanganate method gives a somewhat higher result than that by the bichromate method.[1]

Dr. Attfield said he had been much pleased to hear this paper.

[1] Since the above was published Mr. A. H. Allen has directed my attention to an article by himself that appeared in the *Journal of the Society of Chemical Industry* for 1885, p. 181, and which Mr. Dyer and myself had overlooked. In his paper, entitled "New and little known Applications of the Nitrometer," he largely anticipates the observations recorded above. —W. A. H. N.

The permanganate volumetric method was at one time in great favour, but attention had been drawn to the matter, and it was now known to be perhaps the least accurate. He was glad to hear that Mr. Naylor still suggested a volumetric method; for although he agreed that Kingzett's method of liberating iodine and then determining it was the more accurate, it was too troublesome for the retail pharmacist.

Mr. Bird was also glad that Mr. Naylor had recommended a gasometric method, for he was perfectly certain that was *the* method for the pharmacist. He would be glad to know if he had compared the results obtained by this method with those obtained with the permanganate of potassium titration process, and if they agreed, as he had always considered the latter an accurate way of determining hydrogen peroxide. In looking up the subject he had come across the bichromate of potassium process, but had had no practical experience of it. It seemed to him a great improvement to use a solution of magnesium sulphate, because of the high specific gravity. Some time ago, finding the disadvantage of chloride of sodium solution, he used a solution of ammonium sulphate, which gave very good results, even with the potassium permanganate and acid recommended by the B.P., and he found the figures concordant with those obtained by titration.

Mr. Thos. Tyrer could not quite agree with Dr. Attfield, and thought the permanganate method less accurate, as it depended very much on the manipulation and the conditions. He did not think if the Pharmacopœia was to be a book for the dispensing counter, and the use of the ordinary chemist, that its methods should be so elaborate as to require a condition of things which according to all the prophets was not likely to occur. They heard a great deal about the deficiency in education of the young pharmacist, which was a debatable subject; but it was very desirable that the methods in use should be easily applied, so as to save them from trouble with public analysts or inspectors. There was a real danger in that direction, and there ought to be in the hands of every one who sold drugs some ready and easy means of protecting himself. It was hardly fair to expect that manufacturers and wholesale druggists should always be made the buffer. The evolution of chlorine had given considerable trouble, but a volumetric method was required. The potassium bichromate method, under proper conditions, was quite satisfactory, and it had been used by those who desired accuracy. There was no reason why a gasometric method should not continue to be used, and mercury was

infinitely better than anything else. Kingzett's method was admirable, and gave perfectly accurate results.

Mr. NAYLOR, in reply, said the gentlemen who had asked questions had really for the most part answered them themselves. Mr. Bird would find that his question was satisfactorily answered by the figures given. The point of the paper was to show that a gasometric method was accurate under certain conditions; if, in place of using brine, solution of sulphate of magnesium be used. He preferred that salt because nearly every chemist kept a saturated solution on his shelves; so that he could readily ascertain if his peroxide of hydrogen was of proper strength.

The PRESIDENT said this paper bore all the characteristics of Mr. Naylor's work; it was short and practical, and all would agree in thanking him for it.

After an adjournment for luncheon the following paper was read:—

CONCERNING CASCARA SAGRADA.

By BRIDGET ROSE CLINTON.

The fundamental law of ethics, says Herbert Spencer, is that life-preserving acts should be pleasure-giving acts. The primary principle of pharmacy, I mean the neo-pharmacy of the twentieth century, is that health-giving drugs should be pleasure-giving draughts; and the application of this principal to a concrete case —that of cascara—is the purport of this paper.

Probably one million pounds of cascara are now used per annum to stimulate the sluggish excretory apparatus of citizens of the world. No other bark except cinchona can compare with this, and yet a quarter of a century ago an analogous species, *Rhamnus catharticus*, although well known as a cathartic, was the only kind used in medicine, and of that not one thousand pounds in a year. Now, everybody loves a laxative but loathes a cathartic, and that *Rhamnus* should be raised from the lowest and most despised to the highest and most prized of splanchnic stimulants, is a triumph for pharmacy. The irritant principle of *Rhamnus catharticus*, which produced the intense griping pain and the sanguinous exudate from the intestines, was discovered to be a kind of ferment. An allied species of *Rhamnus*, distinguished as *purshiana*, was ascertained to be almost free from this ferment, and it has further been discovered that the ferment disappears, or rather is changed

into a harmless substance, when the cascara is stored for a couple of years. The credit of introducing *Rhamnus purshiana* to modern medicine seems to be largely due to that American firm whose name is associated inseparably with the drug, and the kudos of demonstrating the importance of keeping the bark a couple of years before use, as well as of demonstrating the utility of cold extraction, appear mostly to be the result of the researches of Mr. John Moss, whose work has by no means been sufficiently recognised, although with his conclusions I cannot always agree.

Although the preparation of the American firm inspired the introduction of extractum cascaræ sagradæ into the British Pharmacopœia, the official extract has always been confessedly different and less potent. It is a notable fact that in the classical monograph published by that firm, cascara is held to yield its virtues only to alcoholic solution. It has been since demonstrated that although these active principles may not be soluble in water, *per se*, they certainly are in water containing other constituents of the bark in solution. This fact is the justification of the B.P. process. The purpose of this paper is to devise a satisfactory formula for syrupus cascaræ aromaticus. Every addition to a formula which is not distinctly useful is injurious. Even sugar disagrees with very many dyspeptics, and every aromatic oil has its enemies, a peculiar idiosyncrasy exists in patients which make certain flavours distasteful to many of them, and hence the aim of the pharmacist must be to devise a flavouring which will disguise the nauseous taste of the drug, make it more active if possible, and supply a carminative property which is confessedly lacking in cascara. Important though the question of flavouring be, it does not rest as yet on any well-ascertained physiological basis, and hence much of our experimenting must be merely empirical.

If there be any such physiological foundation it is this:—Pure bitters are perceived by means of filaments of the gustatory nerve; resins and characteristically odorous substances depend for their perception on the glossopharyngeal filaments. Excitants of the former never give rise to nausea, and for a like reason pungent substances like capsicum, which act mostly on the gustatory nerve, are of comparatively feeble use in correcting the nausea excited by principles like the resinoid and extractive constituents of cascara, which operate in filaments of the glossopharyngeal. On the other hand, certain of the volatile oils, as coriander, angelica, anise, etc., appear to have a selective action on the glossopharyngeal nerve, and hence these may be expected to relieve the acridity of sub-

stances which irritate it. The aim of the British Pharmacopœia has always been to present the drugs in the forms of greatest potency and convenience. The elegancies of taste have been ostentatiously flouted, except in a very few instances, and of these the Syrupus Cascaræ Aromaticus is a sorry example. I had thought that the Conference was mainly responsible for the formula, but its genesis is to be found in a passing reference in an American textbook, where it is stated that the taste of cascara can be effectually disguised by aromatic syrup. The formula, anyhow, is a failure. There is a potential demand for tens of thousands of gallons of it, yet it is seldom asked for. But now to reform it.

(1) Keeping to the orthodox proportion of cascara, I substitute glycerin for syrup. This keeps better, will be more active, and the flavour has a happy lack of the sugary bitterness of the official syrup.

(2) All the fluid extracts of commerce found in the shelves of the pharmacies are of an acid reaction and acetous in character. Most of all is this the case with that of cascara. Moreover, there is a certain amount of ammonia found in the bark, and it seems to keep the active principle in solution when the extract is fresh, whereas the sour extract deposits solid but active matter. Hence I try a formula with sal volatile.

Liq. Ex. Cascaræ	ʒxvi.
Tr. Aurantii	ʒiv.
Alcohol	ʒiii.
Spt. Am. Ar.	ʒi.
Aq. Cinnam.	ʒvi.
Syrupi	ʒxvi.

This I consider an improvement. It is clear, keeps well, and has a decided aromatic taste, but it is yet rather bitter.

(3) There are obvious objections to the use of an alkali, should the aromatic cascara be prescribed in combination, and here a neutral syrup would be preferable. Now the carminative tincture of the B.P. covers a multitude of unsavourities, and I tried it as follows :—

Liq. Cascaræ Sagradæ	ʒviii.
Tr. Aurantii	ʒii.
Tr. Carminativæ	ʒi.
Glycerin	ʒviii.

Now I look on this as quite a delicious formula, but I am reminded of Bentley's criticism of Pope's "Homer"—"It's a pretty poem,

Mr. Pope; but you mustn't call it Homer." This is a palatable elixir, but one can hardly call it a syrup. For a modification one may try:—

Liq. Cascaræ Sagradæ	ʒxvi.
Tr. Carminativæ	ʒiv.
Alcohol	ʒiii.
Aq. Cinnam	ʒvi.
Syrupi	ʒxvi.

which is at least better than the B.P.

(4) Everybody knows that liquorice disguises the taste of cascara fairly well, but the bitter after-taste persists, and requires an aromatic to modify it. The following modification does so:—

Liq. Cascaræ Sagradæ	ʒxvi.
Aq. Cinnam	ʒiii.
Liq. Ext. Glycyrrh.	ʒiii.
Alcohol	ʒii.
Syr. Zingiberis	ʒxii.
Tr. Aurant	ʒiv.

(5) Questioned as to the sense of retaining saffron in decoctum aloes co., the Pharmacopœia revisers asserted it was the sovereignest thing on earth to disguise the taste of aloes. Saffron, of late, has been publicly denounced as inert, but it certainly seems to cover the taste of cascara in the following formula:—

Liq. Cascaræ	ʒviii.
Liq. Ext. Glycrrh	ʒiii.
Tr. Aurantii	ʒii.
Ol. Cassiæ	♏ii.
Syrupi Croc. (i. ad vii.)	ad 20 drms.

(6) Next I proceed to plagiarise. The American cascara cordials are by far the most popular in the market, and it becomes necessary to try a variant of the published recipes, such as one finds in the "Pharmaceutical Formulas":—

Liq. Cascaræ Sagradæ	ʒi.
Liq. Ext. Berberis Aquifol.	ʒi.
Alcohol	ʒiv.
Ol. Coriandri	♏v.
Ol. Anisi	♏ii.
Ol. Aurantii	♏ii.
Ol. Cassiæ	♏i.
Syrupi	ad ℥iiss.

This does not keep well, is somewhat muddy, and obviously is much

overcharged with volatile oils. Many might like the flavour, but *de gustibus non disputandum est.*

(7) *Berberis aquifolium* is rather an innovation in these countries, so we must try a formula without it. This I rather like :—

Liq. Ext. Cascaræ Sagradæ	℥i.
Alcohol	ʒiv.
Ol. Coriandri.	♏v.
Ol. Anisi	♏ii.
Ol. Aurantii	♏ii.
Ol. Cassiæ	♏i.
Ext. Glycyrrhizæ Liq.	ʒiii.
Syrupi . . . . . ad	℥iiss.

Now if there be any fruit from this little series of experiments it is this: The proper aromatics to flavour cascara are orange, coriander, anise, and cassia, whilst liquorice is an almost essential constituent. If I had to select one special formula it would be this :

Liq. Cascaræ Sagrad.	℥i.
Liq. Ext. Glycyrrh.	ʒiii.
Ol. Coriandri.	♏ii.
Ol. Anisi	♏ii.
Ol. Cassiæ	♏i.
Tr. Aurantii	ʒiv.
Ol. Aurantii	♏i.
Syrupi . . . . . ad	℥iiss.

Finally, if the subject be trivial, blame the Blue List; and if the formulæ be commonplace, they will be improved by your criticism.

Dr. Attfield said it was very well to quote Herbert Spencer as saying that anything health-giving ought to be pleasure-giving, but there was another very celebrated authority which said that salvation was acquired through sufferings. With regard to the consideration of the best mode of disguising the taste of a drug, no doubt the labours of the compilers of the Pharmacopœia should be like the elephant's trunk, able to pick up a pin or the trunk of a tree—in other words, to deal as well with a flavouring agent as with a poisonous alkaloid; and they would be happy if they had merely to select what others had devised in the way of disguising an unpleasant flavour, or in securing the action of a powerful drug. Therefore, he thought the lady who had read the paper need not have apologized for what, in her modesty, she appeared to fear might be deemed its triviality. Respecting the question whether

the word "purshiana" or "purshianus" was the more accurate, if he were referred to some of his own writings he would have to admit that purshiana would appear to be the better form, the names of trees being feminine; but he would remind pharmacists of one very important botanical canon, which was that the name first given to a plant by a discoverer, in this case De Candolle, must be the name to be used in future, whether it was right or wrong, and that word was "purshianus"; so that the reader of the paper was not correct, though following others, in giving the name as "purshiana." Desfontaines desired to honour Baron Langsdorff in the name "Copaifera Lansdorfii," but had run risk of failure through inadvertently omitting the g and one f, for "Lansdorfii" it had to remain. Pity the poor editor of a Pharmacopœia, who has to ignore philological truth and femininity in favour of botanical perspicuity and unerring identification.

The PRESIDENT, in thanking the reader of the paper, said there was an unmistakable advantage in sticking to a name as spelt originally, even though the orthography was not correct. The man who first described a plant should have the right of spelling it as he liked. The danger of correcting these names was that what might be thought right in one generation would not be thought correct in another.

Miss CLINTON thanked the President and Dr. Attfield for their remarks, but said she preferred the feminine gender.

The following paper was then read:—

THE CHEMISTRY OF THE BARK OF ROBINIA PSEUD-ACACIA, LINNE

(*False Acacia or Common Locust*).

By FREDERICK B. POWER, PH.D.

In a paper read by me before the Wisconsin Academy of Sciences, Arts and Letters, on December 27th, 1889, and published in the *Pharm. Rundschau*, New York, February, 1890, pp. 29–38, entitled: "On the Chemical Constituents and Poisonous Principle of the Bark of *Robinia Pseud-acacia*, Linné" (Power and Cambier), an account was given of some recent severe cases of poisoning produced by chewing the bark of the Robinia, together with an investigation which had been undertaken during the preceding summer for the purpose of determining the nature of the poisonous principle. In

the paper referred to (abstracted in the *Pharm. Journ.*, 1890, p. 711), the more commonly occurring constituents of the bark were noted, as also the isolation of a substance which was precipitated by all the usual alkaloidal reagents and believed to be choline, although observed to differ from the latter in some of its characters. The most important observation, however, to which attention was directed was the fact that the toxic action of Robinia bark is due to a poisonous proteid, similar in its character to ricin and abrin, and, being guided by the classification of the albuminoids adopted at that time by Hoppe-Seyler, it was stated that "it would appear to be correctly and conveniently designated as a *phyt-albumose*."

In the former publication some of the general chemical characters of this proteid were described, and its extremely poisonous action—manifested by severe and prolonged attacks of vomiting and purging—was also fully and satisfactorily established by experiments upon myself and my assistant, Mr. Cambier, as well as upon animals. It was likewise shown that the proteid, which was extracted from the bark by cold water, is coagulated by heat, and that its toxic properties thereby become completely destroyed. This served to explain why in some of the preliminary experiments for the isolation of the poisonous principle a considerable amount of an extract of the bark, prepared by the aid of heat, could be taken by us without any ill effects. The isolation of the poisonous proteid seemed furthermore of particular interest, inasmuch as it was believed to be the first, and is as yet, apparently, the only recorded observation of the occurrence of such a body in a bark, the other allied substances, such as ricin, abrin, and crotin, being found in the seeds of the respective plants.

With the advance in knowledge of the proteid substances it seemed to me desirable to again take up this investigation, and at the same time to examine more closely the other constituents of the bark.

The present publication, fortunately, also affords an opportunity of considering some statements in recent German literature pertaining to this subject, from which it would appear that the results of my previous investigation have been to some extent overlooked, and that incorrect deductions have thereby been formed. My attention was first directed to this by a short communication from Professor Kobert to the *Apotheker Zeitung* of May 25th, 1901, p. 365, with reference to a note published a short time previously by Professor E. Schmidt (*loc. cit.*, 1901, p. 357) on "Robinin"—a name given in 1861 by Zwenger and Dronke to a colouring matter

obtained by them from the flowers of *Robinia Pseud-acacia.* An abstract of Professor Kobert's observations may be given in the following translation: "It appears to me in the interest of your readers to point out that *in medical literature the word Robinin has hitherto been used in another sense.* In a few days there will appear in Rostock a dissertation of my pupil, Dr. Carl Lau, 'Ueber vegetabilische Blutagglutinine,' in which there will be a report on the Robinin of medical authors, and a *proposal to change the name of this to Robin*, since it possesses an action very similar to abrin, ricin, and crotin, but weaker. *Robin was first described under the name of Robinin by Power and Cambier* (*Pharm. Journ.*, 1890, p. 711). They found this substance, *designated by them as a phyt-albumose*, to the extent of 1·6 per cent. in the bark of *Robinia Pseud-acacia.*"

Such a confusion of names would naturally be unfortunate, and I was not aware that it existed, since in my original paper and in the abstract cited no mention whatever was made of the name "Robinin" in connection with the toxic proteid. In a private communication from Professor Kobert he has kindly informed me that the use of the word *Robinin*, which was incorrectly attributed to me, has occurred through inaccurate abstracts in medical literature.

In the above-mentioned dissertation of Dr. Carl Lau (Rostock, 1901), for a copy of which I am indebted to Professor Kobert, there are some passages relating to the Robinia proteid which it would seem desirable to note in this connection in order that some comment may be appended to them. Thus, on pages 16–17 it is recorded: "*Als viertes pflanzliches Blutagglutinin ist das Robin* (*früher Robinin*) *zu nennen, welches vor Jahren von Professor Kobert als solches erkannt, bis jetzt weder vom Entdecker noch von jemand anderem genauer als solches beschrieben worden ist. Power und Cambier* (*Pharm. Journ.*, 1890, p. 711) *fanden einen als Robinin bezeichneten Stoff zu* 1·6 *per cent. in Form einer Phytalbumose in der Rinde der Robinia pseudacacia neben einem Alkaloid, welches Aehnlichkeit mit Cholin und Neurin hat. Ich möchte in ersterer Substanz unser Robin erblicken. . . . . Robinia pseudacacia ist wissenschaftlich recht wenig untersucht worden.*"

In consideration of the above statements it will be sufficient to refer those interested in the subject to my original publication (*loc. cit.*).

On page 28 the author appends the following note: "*Ich habe in diesem Falle nicht, wie bei Abrin, Ricin und Crotin eine* 1 %

ige, sondern eine, 5 % ige Robinlösung verwandt weil ein grosser Theil des Merck'schen Präparats wegen seines Alters—es stand schon 12 Jahre bei Prof. Kobert—unlöslich geworden war."

There is apparently a slight error in this statement, according to which it would appear that Robin had been prepared by Merck at least twelve years ago, whereas there is no evidence that the substance in question was known prior to the publication of my paper in 1890.

On page 40, in connection with physiological experiments for determining the toxic action of Robin, Dr. Lau remarks as follows: "*Ich würde sehr gern noch eingehendere Versuche darüber angestellt haben, ob die giftige Eiweisssubstanz der Robinienrinde ein Albumin, eine Albumose, oder ein Globulin, oder ein Gemisch zweier Substanzen ist. Zu derartigen Versuchen hätte ich jedoch viel grössere Mengen von Material gebraucht als sie mir zur Verfügung standen. Ich musste mich daher damit begnügen festgestellt zu haben dass es sich thatsächlich um eine giftige Eiweisssubstanz handelt.*"

From the latter statement one would naturally be led to infer that the toxic action of the Robinia proteid had only become established as an actual fact by these recent experiments, whereas this would seem to have been sufficiently demonstrated more than eleven years ago. It appears the more remarkable that this should have been overlooked in view of the fact that in acknowledgment of a specimen of the proteid sent to the late Professor Flückiger, of Strassburg, he wrote me under date of February 4th, 1892, as follows: "I have to thank you for the poison of Robinia, which I sent finally to Prof. Kobert, Dorpat (Russia). He has also prepared the poison, and states now that it nearly agrees with your preparation."

At the close of his dissertation, p. 63, Dr. Lau likewise refers to the previously mentioned crystalline colouring matter obtained from Robinia flowers, termed *Robinin*, which has been under investigation by Professor A. G. Perkin (*Proc. Chem. Soc.*, 1900, No. 219, p. 45; 1901, No. 236, p. 87) and is at present also being examined by Professor E. Schmidt (*Apotheker Zeitung*, 1901, p. 357), and remarks as follows: "*Man wird daraus ersehen, wie zeitgemäss es war, unsern Giftstoff aus der Robinie in Robin umzubenennen.*"

It is evident that the name *Robin*, as applied to the toxic proteid of Robinia bark, is a very appropriate one, and it need finally only be observed that this designation has, in fact, been employed by Ehrlich in his physiological investigations, to which I shall

subsequently refer, as also in pharmaceutical literature by E. Schmidt (*Pharm. Chemie*, third edit., 1896, Bd. ii. p. 1,647), who refers to it as follows: "*Als Robin wird das in der Rinde von Robinia Pseud-acacia enthaltene, stark giftige Toxalbumin bezeichnet.*"

(1) The Toxic Proteid, or Robin.

In the first chemical examination of this bark the material was collected by myself in the neighbourhood of Madison, Wisconsin, where the tree is largely cultivated, and only the light-coloured inner bark was employed. The material for the present investigation, which was quite the same in its character, was obtained from France, and had been freshly collected.

Preparation of the Proteid.—The toxic proteid was first obtained by adding to a cold, concentrated, aqueous infusion of the bark a considerable quantity of strong alcohol, and actively shaking, when a voluminous flocculent precipitate is produced. After standing for several hours, the precipitate was collected on a filter, and washed with a little alcohol. It then forms a nearly white, slimy mass, which, when spread on plates of glass and dried in a vacuous desiccator over sulphuric acid, is obtained in the form of yellowish-brown scales. The yield of dry substance was 1·66 per cent. of the weight of the bark. In the present investigation the yield of proteid, prepared in practically the same manner, was 1·14 per cent. In both cases the air-dry, coarsely-ground bark was used, but the yield of proteid will naturally depend upon the completeness of its precipitation, and probably also upon the season at which the bark is collected, the late spring or early summer being doubtless the most favourable period.

The proteid may also be prepared by extracting the ground bark with a 10 per cent. solution of sodium chloride, and subsequently saturating the filtered liquid with ammonium sulphate. The precipitate is then spread on plates of glass to dry. By this method it is associated with a considerable amount of ammonium sulphate, which may be removed by dialysis, and the filtered dialysed liquid may then be precipitated by alcohol; but during the operation a considerable portion of the proteid is rendered insoluble. For the experiments here described the proteid was prepared by simply allowing the ground bark to stand for about twenty-four hours in contact with sufficient cold water to cover it, expressing, filtering, and adding to the filtrate a large volume of strong alcohol.

Characters of the Proteid.—The precipitated proteid, either

while still moist or when dried, does not again dissolve completely in water, but is rendered soluble by the addition of a little alkali. A specimen dried over sulphuric acid afforded (i.) 4·12, (ii.) 3·74 per cent. of ash; it would be difficult to determine to what extent this represents an actual impurity, inasmuch as certain inorganic elements appear to form an integral part of the complex molecule.

The solution of the proteid has an acid reaction. It is precipitated by the mineral acids, and, especially when acidulated, by all the usual alkaloidal reagents, such as potassium-mercuric iodide, potassium-bismuth iodide, iodine solution, phosphomolybdic acid, tannic acid, picric acid, mercuric chloride, and by copper acetate and potassium ferrocyanide, as also by ferric chloride and the neutral and basic acetates of lead.

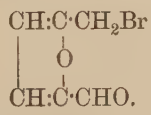
The proteid affords the various colour reactions characteristic of this class of substances, such as the following: (1) The so-called biuret reaction, by adding to the aqueous solution of the proteid a solution of caustic alkali and a few drops of a dilute solution of copper sulphate, when a handsome bluish-violet colour is produced. (2) The xanthoprotein reaction, or deep yellow colour produced in the solution by strong nitric acid. (3) Millon's reaction, with a solution of mercurous nitrate, which produces a rose-red precipitate. Although this reaction is obtained with all the natural albumens, it is stated to be afforded only by such of the albumoses as belong to the *hemi* group. (4) Molisch's reaction, with α-naphthol and sulphuric acid, which produces a violet colour. (5) Lieberman's reaction, by heating a little of the dry proteid with concentrated hydrochloric acid, when a bluish-violet colour is produced. As both this reaction and the preceding one are recognized as furfural reactions, they are supposed to indicate the presence of a carbohydrate group in the proteid complex.

The reaction of Adamkiewicz, produced by the action of concentrated sulphuric acid upon a solution of the proteid in glacial acetic acid, could not be obtained in the present instance, but this may be easily explained by the recent observations of Hopkins and Cole (*Chemical News*, February, 1901, pp. 73, 85), who have shown that the production of the particular colour is dependent upon the presence in the acetic acid of a small amount of an impurity, which they found to be glyoxylic acid, $\begin{array}{c} CH(OH)_2. \\ | \\ COOH. \end{array}$

Such specimens of acetic acid as do not contain this impurity, or at least not in sufficient amount, will therefore give a negative result.

In order to ascertain whether a sugar could be obtained from the proteid by hydrolysis, 1 Gm. of the latter was heated in a sealed tube with 25 c.c. of 5 per cent. sulphuric acid for eight hours at 100° C. The liquid was then filtered, digested with barium carbonate for the removal of the free acid, and decolorised with animal charcoal. It was found to be slightly dextro-rotatory, and reduced Fehling's solution, but gave only a small amount of a rather unsatisfactory osazone, melting at about 146°–147° C.

With consideration of the interesting investigations of Fenton and Gostling on "the action of hydrogen bromide on carbohydrates" (*Journ. Chem. Soc.*, 1898, 73, p. 554, and 1901, 79, p. 361), in which it has been shown that certain classes of carbohydrates when acted upon at the ordinary temperature with dry hydrogen bromide in ethereal solution give an intense purple colour, and suggested that the rapid production of this colour was indicative of *ketohexoses*, or of substances which produce them by hydrolysis, it was thought of interest to try the action of this reagent upon the Robinia proteid. It has been noted, however, by Fenton in his most recent communication that the production only of a purple colour is not sufficiently conclusive, and that the observation should be confirmed by the actual isolation and identification of crystals of the respective compound ω—bromo-methylfurfural $C_6H_5O_2Br$, or



The method he has suggested as most suitable for quantitative purposes was therefore adopted in the following experiment. One gramme of the proteid and 12·5 c.c. of chloroform, which had been saturated at 0° C. with dry hydrogen bromide, were heated together in a sealed tube at the temperature of the water-bath for two hours. An insignificant purplish colour was produced on the surface of the tube around the substance, but even after standing for several hours, this colour was not imparted to the liquid, whilst the substance itself had become quite black. The chloroform solution was then treated successively with anhydrous sodium carbonate and a few drops of a strong solution of this salt, dried over calcium chloride, and finally allowed to evaporate in a weighed glass dish. A very slight residue was obtained, which contained no crystals, from which it may be inferred that a ketohexose grouping of the carbohydrate complex does not exist in the proteid molecule.

In order to ascertain whether the Robinia proteid, or any substance associated with it, is capable of acting as an enzyme or ferment, the following experiments were made, which have been attended with interesting results.

To an aqueous solution of amygdalin, contained in a test tube, a small amount of the dry, precipitated proteid was added, the mixture well shaken and the tube corked and set aside. After standing for a short time at the ordinary summer temperature a strong odour of bitter almond oil was developed, and the filtered liquid gave an abundant reaction for hydrocyanic acid. The amygdalin had thus been split up in the same manner as by emulsin, and it may be noted that this decomposition had previously been observed to be effected by the ferment (myrosin) contained in a cold infusion of white or black mustard seed (Flückiger, *Pharm. Chemie*, 2nd edit., pt. ii. p. 10), as also by diastase (Robiquet) and beer yeast (Ronke). (Compare Husemann, *Die Pflanzenstoffe*, 2nd edit., p. 1,020.)

A little of the proteid was then added to an aqueous solution of pure potassium myronate, when, after standing for a short time under the same conditions, a strong odour of mustard oil was developed. This result appears to be of particular interest, inasmuch as emulsin and beer yeast are stated to be incapable of effecting the decomposition of potassium myronate, and the Robinia ferment would therefore more closely resemble myrosin than emulsin. Whether this fermentative action represents a function of the toxic proteid, or whether it is due to a substance associated with it, is a question that must at present remain undecided. The occurrence of such a ferment indicates, moreover, that it stands in some genetic connection with a glucoside existing in the bark, which will be described later on.

In his recently published dissertation (*loc. cit.*) Dr. Carl Lau has recorded some experiments with the toxic proteids, ricin, abrin, and crotin, which were undertaken in order to ascertain whether these bodies possess the property of agglutinating other cellular elements besides the red corpuscles of the blood. It was thus found, for example, that when allowed to act upon either boiled or unboiled milk, under definite conditions, they are capable of coagulating the casein in a manner similar to that of the rennet enzyme. As the Robinia proteid was apparently not included in these experiments, it was thought desirable to subject it to corresponding tests, which were conducted as follows. Into four test tubes, marked respectively *A*, *B*, *C*, and *D*, were brought the following liquids.

A contained 10 c.c. of fresh milk. *B* contained 10 c.c. of milk with 1 c.c. of a 5 per cent. solution of Robin in water. *C* contained 10 c.c. of milk with 1 c.c. of a 5 per cent. solution of Robin in 10 per cent. solution of NH_4Cl. *D* contained 10 c.c. of milk with 5 c.c. of a concentrated infusion of Robinia bark. A similar series of tubes was prepared with the use of freshly boiled milk. All the tubes were then placed in water kept at a temperature of 35°–40° C. In about fifteen minutes the unboiled milk in tubes *B*, *C*, and *D* began to curdle, and after one hour the corresponding tubes containing boiled milk began to change. After standing for six hours the same tubes of both boiled and unboiled milk were considerably curdled, the change being most marked in the latter. The tubes *A*, containing both boiled and unboiled milk, which served for the purpose of control, remained quite unchanged. From these results it is evident that the Robinia proteid is likewise capable of effecting changes similar to those produced by the rennet enzyme.

The exact position which should be assigned to the so-called *Robinia proteid* or *Robin* among the various groups of related substances is somewhat difficult to determine, partly on account of the different methods of classification or differences of nomenclature adopted by various investigators. With consideration of the deportment of these bodies, as described in the recent work of Cohnheim, entitled *Chemie der Eiweisskörper*, Braunschweig, 1900, it would appear to belong to the group which has received the distinctive designation of *Proteids*, and possibly to the division of so-called *nucleo-proteids*. It may be noted, however, that the term "proteid" is employed by German chemists in a much more restricted sense than in this country or in France, where it is commonly understood to include all albuminous substances. Although Robin has some of the properties both of an albumose and of a globulin, it differs, on the other hand, from these in being soluble in water, in being completely coagulated by heat, and in some of the reactions which are accepted as characteristic of them. It appears, moreover, quite probable that the Robinia proteid consists of more than one albuminous body, for it has been observed that a saline solution extracts a larger amount of proteid from the bark than water alone, and, in addition to its previously described characters, including those of an enzyme, by carefully heating its solution it may be resolved into fractions having different coagulating points.

Physiological Action of the Proteid. The most recent investi-

gation of the physiological action of Robin is that included in the dissertation of Dr. Carl Lau (*loc. cit.*), who has shown that it has the property of agglutinating the red corpuscles of the blood of various animals, but that it has not this effect upon human blood or upon that of the dog and cat. Its action in this respect is also less intense than that of ricin, abrin, and crotin. Experiments on animals, chiefly rabbits, by hypodermic injections of a solution of Robin, have shown that its toxic action is attended by an alteration of the kidneys, often producing a nephritis, or at least manifested by the presence of more or less albumen, hæmoglobin and cylindrical casts in the urine.

In this connection it would seem desirable to refer very briefly to some observations of Ehrlich, which relate to the immunising property of the Robinia proteid. In his paper entitled "Die Wertbemessung des Diphtherieheilserums und deren theoretische Grundlagen" (*Klinisches Jahrbuch*, Bd. vi., 1898, p. 315), in which he considers the genesis of the toxoids which are found in relatively large quantities in long-kept diphtheria poisons treated with preserving media, Ehrlich remarks as follows: "In the case of the vegetable toxalbumins (ricin, abrin, *robin*, crotin) there are also positive indications of the presence of toxoids. The fact appears to me to be specially worthy of notice that the anti-toxin produced by robin—the toxalbumin of *Robinia pseud-acacia*—corresponds almost entirely in its properties to anti-ricin, notwithstanding that the two initial bodies—robin and ricin—are certainly different. *These conditions indicate that the much less poisonous robin represents a naturally occurring toxoid of ricin.*" It may be explained that Ehrlich employs the term "toxoid" to designate a modified toxin, but he refrains from any hypothesis regarding their formation.

In a paper by George Ogilvie, B.Sc., M.R.C.P., entitled "Some Remarks on the Inheritance of Acquired Immunity" (*Brit. Med. Journ.*, May, 1901, p. 1070), the following further observation is recorded: "Ehrlich's ingenious experiments—made on mice with the vegetable toxin of ricin, abrin, and *robin*—have led him to the conclusion that no trace of immunity is ever conferred by parent upon offspring through the germinal cells, either by the sperm or by the ovum."

(2) Other Constituents of the Bark.

As a preliminary test for confirming the presence of organic bases, which a previous investigation had indicated to be present,

20 Gm. of the ground bark were digested for several days with 100 c.c. of Prollius fluid. The filtered liquid left on evaporation a slight amorphous residue, which when taken up with acidulated water, afforded abundant reactions with all the usual alkaloidal reagents.

100 Gm. of the ground bark were then extracted successively by various solvents, in the following order: (1) *Light petroleum* (b.p. 40–60° C.).—This afforded 1·15 per cent. of fatty matter, which, when treated with acidulated water, gave no alkaloidal reaction. (2) *Ether.*—This afforded 0·4 per cent. of a brownish resin, which gave no alkaloidal reaction. (3) *Chloroform.*—This afforded 0·2 per cent. of a brownish resin, which when extracted with acidulated water, gave a slight alkaloidal reaction. (4) *Alcohol.*—The concentrated, very dark-coloured alcoholic liquid was poured into water, in order to precipitate resinous matter. The aqueous filtrate was abundantly precipitated by alkaloidal reagents. It slightly reduced Fehling's solution, but to a much greater extent after heating with a little hydrochloric acid, when a peculiar, somewhat aromatic odour was developed, thus indicating the presence of a glucoside.

A larger quantity of the bark was now operated upon as follows. Two kilos of the ground bark were extracted first with cold, and then with hot alcohol. After distilling off the alcohol the liquid was poured into water, and the aqueous liquid filtered from the precipitated fatty matter and resin. The character of the latter bodies will be considered later.

The aqueous liquid was treated with lead acetate for the removal of colouring matter, filtered, and the excess of lead removed by hydrogen sulphide. It was now found to be precipitated by all the usual alkaloidal reagents, and was subsequently evaporated to a thick syrup, and extracted in a Soxhlet with strong alcohol. To the dark-coloured alcoholic solution a saturated alcoholic solution of mercuric chloride was added, which produced a whitish precipitate, soon changing, however, to a very dark, resin-like mass. After standing for a time, the clear liquid was decanted, and to the latter another portion of mercuric chloride was added, which produced a similar precipitate. To the liquid decanted from the second precipitate a third portion of mercuric chloride was added, with the same result as before. The three precipitates (*a*), (*b*), and (*c*), after being washed with a little alcohol, were extracted with warm water, when in each case a considerable amount of a dark-coloured amorphous substance remained undissolved. The filtered

liquids were all separately treated with hydrogen sulphide to remove the mercury, and again filtered.

(*a*) This was a dark-coloured liquid, which was treated with animal charcoal, then made alkaline with sodium hydrate, and shaken out five times successively with hot amyl alcohol. The latter was then shaken with water, acidulated with hydrochloric acid, when dense white fumes were produced, probably due to ammonia. The acid liquid gave all the characteristic alkaloidal reactions, and, after treatment with animal charcoal, was obtained nearly colourless. It was allowed to evaporate in a vacuous desiccator over potash and sulphuric acid, but, as it became concentrated, it acquired an almost black colour, showing that decomposition had ensued. It was, however, taken up with a little absolute alcohol, treated with animal charcoal, and the solution precipitated by platinic chloride. 0·0360 Gm. of this salt gave on ignition 0·0160 Gm. of platinum or 44·4 per cent. Pt. The precipitate, therefore, consisted simply of ammonium-platinic chloride, which requires 43·9 per cent. Pt.

The liquid, after extraction with the hot amyl alcohol, when acidulated, still afforded a strong alkaloidal reaction, but it was evident that during contact with the alkali the basic substance was being continually decomposed with the evolution of ammonia.

(*b*) This liquid was treated in the same manner as described under (*a*), and although originally nearly colourless, when allowed to evaporate in a vacuous desiccator, it afforded an almost black residue. The latter, when treated with absolute alcohol, left a crystalline residue of ammonium chloride, and from the alcoholic solution a small amount of platinum salt was obtained, which, on analysis, also gave figures agreeing with those required for ammonium chloride. 0·0405 Gm. of the salt gave on ignition 0·0180 Gm. of platinum, or 44·4 per cent. Pt.

(*c*) This liquid, which seemed to be the purest of the three fractions, was treated in the same manner as the two preceding ones, the residue left on evaporation contained some crystals of ammonium chloride, and the platinum salt obtained from the alcoholic solution was analysed with the following result: 0·056 Gm. of the salt gave on ignition 0·021 Gm. of platinum or 37·5 per cent. Pt. It is possible, therefore, that this fraction contained one of the methylamines, or a mixture of these bases. The amorphous brown residues which remained on treating the alcoholic mercuric chloride precipitates with water were suspended in water and decomposed by hydrogen sulphide. The filtrate was very dark in

colour, gave precipitates with alkaloidal reagents, and also developed ammonia when heated with a caustic alkali. On evaporation it left simply a dark amorphous residue.

The alcoholic liquid remaining after precipitation with alcoholic mercuric chloride was treated with hydrogen sulphide to remove the excess of mercury, and filtered. After distilling off the alcohol, a little water was added, and the liquid further evaporated, when a peculiar disagreeable odour was developed, and a considerable amount of a black resin separated. After purifying the very dark-coloured liquid by means of lead subacetate it still afforded a strong alkaloidal reaction. It was finally made strongly alkaline with potassium hydrate, distilled, and the distillate collected in water acidulated with hydrochloric acid. On evaporating the acid distillate to dryness, and treating the residual salt with absolute alcohol, a considerable amount of ammonium chloride was left undissolved. The alcoholic solution, after evaporating and again taking up the residue with alcohol, afforded a small amount of a platinum salt which was analysed with the following result: 0·0772 Gm. of the salt gave on ignition 0·03 Gm. of platinum, or 38·86 per cent. Pt. The platinichloride of dimethylamine contains 38·98 per cent. of platinum, but it is possible that the salt examined consisted of a mixture of amines. The results obtained, however, clearly demonstrate that the organic bases contained in the original liquid easily become decomposed by the method employed for their isolation, and especially by the action of caustic alkalies, with the evolution of ammonia, and apparently one or more amines.

A similar result was obtained by extracting a kilo. of the ground bark with acidulated water, and subsequently making the liquid strongly alkaline with potassium hydrate and distilling. The distillate had a strongly ammoniacal, but also distinctive odour, and, when neutralized with hydrochloric acid, afforded on evaporation about 9 Gm. of a salt consisting chiefly of ammonium chloride. On treating this with alcohol, and fractionally precipitating with platinic chloride, salts were obtained which gave respectively 38·88 per cent., 40·32 per cent., and 40·48 per cent. of platinum.

Two other portions of bark of 1 kilo. each were extracted, one with cold water, and the other with acidulated water, then mixed with milk of lime and separately distilled. From each portion about 13 Gm. of dry salt were obtained, consisting almost entirely of ammonium chloride. The extremely small amount that was finally soluble in absolute alcohol afforded platinum salts contain-

ing respectively 42·10 per cent., and 42·46 per cent. of platinum, which indicated that these were also mixtures.

The large amount of ammonia produced in the last-mentioned experiments is naturally due to the direct decomposition of the soluble proteid by the caustic alkali.

For the further examination of the constituents of the bark, with the hope of determining not only the character of the substance affording the alkaloidal reactions, but also the nature of the glucosidal body whose existence had been indicated, a larger amount of material was operated upon in the following manner.

Seven kilos. of the ground bark were extracted with hot alcohol in a continuous extraction apparatus, and the alcohol for the most part distilled off. The dark-coloured liquid thus obtained was mixed with water to separate fatty and resinous matter, and the liquid filtered. The filtered liquid was then treated with basic lead acetate, which produced a dense precipitate, consisting chiefly of tannic and colouring matter, but apparently nothing of further interest. The filtrate from the lead precipitate was treated with hydrogen sulphide, and again filtered, when it had a bright yellow colour. It was now concentrated under diminished pressure, in order to avoid any darkening in colour, until it acquired an almost syrupy consistence. On further evaporation it formed a thick syrup, but without a distinctly sweet taste. A small portion which had been allowed to stand for a considerable length of time deposited a few small, needle-shaped crystals, which could not be separated from the syrupy liquid, but which will be referred to later. The liquid shows the following behaviour toward reagents. It is precipitated by all the usual alkaloidal reagents, and more abundantly when acidulated with hydrochloric acid. When heated with an alkali hydrate it evolves ammonia, at the same time developing a peculiar odour, reminding somewhat of methylamine. It slightly reduces Fehling's solution, but much more strongly after heating with hydrochloric acid. The original solution was dextro-rotatory, and afforded an osazone melting at 197° C.

The entire liquid was now divided into two equal parts, which may be designated as *A* and *B*.

(*A*) To this portion of the liquid an aqueous solution of mercuric chloride was added. A light-coloured precipitate was thus formed, which continued to redissolve until a considerable excess of the reagent was added. The precipitate was finally collected on a filter, washed with a little water, in which it was somewhat

soluble, then suspended in water and decomposed by hydrogen sulphide. The filtrate from this decomposed precipitate was of a deep red colour, and was allowed to evaporate in a vacuous desiccator, when a very dark-coloured residue was obtained, which was taken up with a little absolute alcohol. This alcoholic solution afforded with platinic chloride only a small amount of a resin-like precipitate, which was not suitable for further examination.

The filtrate from the original mercuric chloride precipitate was then treated with hydrogen sulphide, for the removal of the excess of mercury, and filtered. To the strongly acid liquid, which still gave the alkaloidal reactions as strongly as before, an additional 10 c.c. of hydrochloric acid were added, and it was then boiled in a flask provided with a reflux condenser for about three hours. The liquid, when cold, was filtered from a considerable amount of black resinous substance, and distilled. The distillate, which had a peculiar aromatic odour, was shaken out with ether, the latter separated and allowed to evaporate, when a small amount of an oily residue was obtained, having an aromatic, vanilla-like, but at the same time somewhat empyreumatic odour. It gave no reaction with ferric chloride. The strongly acid liquid remaining in the flask was again filtered, and shaken several times successively with ether. The ethereal liquids were of a reddish colour, and when evaporated left a dark-red oily residue. On treating this with water a small amount of white needle-shaped crystals were separated. These were collected on a filter, and after washing with a little chloroform and ether, in which they were not very freely soluble, they were obtained quite white. On subsequently shaking the acid liquid with several successive portions of chloroform, more of the red amorphous substance was obtained, from which, by means of water, a small additional amount of nearly colourless crystals was obtained.

The purified crystals, extracted by means of ether, formed white, silky needles, and contained no nitrogen. They melted sharply at 198°–199° C. (corr.) The crystals have an acid reaction to test paper, and when brought into a little solution of caustic potassa or soda they dissolve with a rose-red colour, which soon fades. Nitric acid produces a deep red colour, soon changing to yellow, and ferric chloride produces a slight brown coloration.

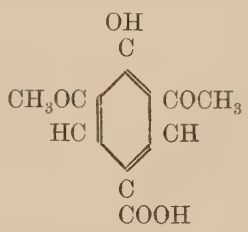
When dried in a water-oven at 100° C. the crystals lost nothing

in weight, and were then analysed, with the following result:—0·0422 Gm. of substance gave 0·0836 Gm. CO_2 and 0·0194 Gm. H_2O.

Calculated for $C_9H_{10}O_5$.	Found.
C = 54·5 per cent.	54·0 per cent.
H = 5·1 per cent.	5·1 per cent.

During the combustion the substance was observed to gradually sublime, forming glistening, silky crystals on the cooler part of the tube.

Although the amount of pure substance was only sufficient for one analysis, the figures obtained are observed to agree remarkably well for a body of the composition $C_9H_{10}O_5$, which is that of *syringic acid*, or the 3·5 – dimethyl ether of gallic acid.



There are, moreover, some other facts which serve to establish the identity of this substance as syringic acid. In the first place, its melting point is given in Beilstein's *Handbuch der organischen Chemie*, Bd. ii., p. 1,921, as 202° C., which, being probably uncorrected, would agree very well with that observed. In the second place, it was obtained from a substance, evidently a product of hydrolysis, forming an amorphous, rose-red mass, which would therefore correspond in its properties to *syringenin*, a body which, together with glucose, is formed from the glucoside *syringin* by heating with dilute mineral acids, thus:—

$$\underset{\text{Syringin.}}{C_{17}H_{24}O_9} + H_2O = \underset{\text{Syringenin.}}{C_{11}H_{14}O_4} + C_6H_{12}O_6$$

It is known that syringin, when oxidised, is converted into *glucosyringic* acid, and that the latter by hydrolysis forms syringic acid and glucose.

$$\underset{\text{Glucosyringic Acid.}}{C_{15}H_{20}O_{10}} + H_2O = \underset{\text{Syringic Acid.}}{C_9H_{10}O_5} + C_6H_{12}O_6$$

This would easily explain in the present instance the occurrence of the small amount of syringic acid which was found associated with the syringenin in the products of hydrolysis. It naturally also indicates the occurrence in Robinia bark of the glucoside *syringin*, which was first found in the bark of *Syringa vulgaris*, and subsequently in the bark of *Ligustrum vulgare* (compare van Rijn, *Die Glykoside*, p. 356). It is probable that the few crystals which were observed to have been formed in a small portion of the original liquid on standing for some time, as previously noted, consisted of this initial substance, although they could not easily be isolated from the thick syrup. The fact that the crystals of syringic acid did not pre-exist in the original liquid, but that they were a product of hydrolysis, was also quite satisfactorily proved by extracting a portion of the bark with hot water, purifying it from colouring matter by means of lead subacetate, and shaking out with ether, when no crystalline substance could be obtained. It was also confirmed by the examination of another product, which will be described further on.

The liquid from which the syringic acid had been obtained had a strongly reducing action upon Fehling's solution, and was dextrorotatory. From a small portion of it an osazone was prepared which melted at 205–206° C. The melting point of δ-glucosazone is 202° C., and the hydrolysed liquid therefore contained a considerable amount of δ-glucose.

It was noted in connection with the Robinia proteid, in the first part of this paper, that either this body or a substance associated with it has the properties of an enzyme, which is in accordance with the view that these principles accompany glucosides in plants. It was furthermore noted that this enzyme resembles myrosin, the ferment contained in mustard seed, in its properties, inasmuch as, like the latter, it not only acts upon potassium myronate with the formation of mustard oil, but also develops hydrocyanic acid and benzaldehyde from amygdalin. It therefore appears to be an interesting fact that sinapin, which occurs ready formed in black mustard seed, and which is likewise formed from the sinalbin contained in white mustard seed through the action of the ferment myrosin, is converted by the action of alkalies into choline and sinapinic acid, and that the latter body is assumed to stand in direct relation to syringenin, syringenin being regarded as the alcohol of sinapinic acid (compare van Rijn, *loc. cit.*, p. 108). This naturally suggests the possibility of some intimate organic connection between the enzyme and the glucoside of Robinia bark.

As the hydrolysed liquid, which had been extracted by ether, still afforded a strong reaction with alkaloidal reagents, and as it had previously been found that the body producing these reactions could not be extracted by immiscible solvents, either from acid or alkaline solutions, the entire remaining liquid was precipitated by potassium-bismuth iodide. This afforded a considerable amount of a flocculent, brick-red precipitate, which was collected on a filter, washed with a little acidulated water, then suspended in water, and decomposed by hydrogen sulphide. The filtrate, after treatment with a little animal-charcoal, was shaken with freshly precipitated silver hydroxide for the removal of the hydriodic acid, and was then rapidly filtered, as it was observed that even by contact with the silver hydroxide the organic base was gradually becoming decomposed with the evolution of ammonia or an amine, for dense white fumes were produced in contact with the vapour of hydrochloric acid. A few drops of hydrochloric acid were then added to precipitate the small amount of dissolved silver hydroxide and convert the base into an hydrochloride, again filtered, and the slightly coloured liquid allowed to evaporate in a vacuous desiccator over caustic potash and sulphuric acid. As there was no indication of a crystalline salt being formed, the concentrated solution was at once precipitated by gold chloride. The precipitated aurichloride, which was amorphous and of a light yellow colour, was quickly transferred to a filter, washed with a little water, and dried. An attempt to crystallise it from alcohol was unsuccessful. It melted somewhat indefinitely at about 117° C., and was analysed with the following result: (1) 0·1030 Gm. of the salt gave 0·0392 Gm. of gold, or 38·06 per cent. Au. (2) 0·1982 Gm. of the salt gave 0·0754 Gm. of gold, or 38·04 per cent. Au.

A more complete analysis of the salt was considered unnecessary, inasmuch as it had been prepared from an indefinite substance, or possibly mixture of bases, which could not be obtained in a crystalline form. The substance in question, however, was evidently not choline, which the results of a previous investigation had led me to believe might be present in the bark, since choline aurichloride would require 44·4 per cent. of gold. As in the former instance a platinum salt was employed for analysis, an error had probably been introduced through the hitherto unobserved formation of ammonia by the action of the silver hydroxide. The observed alkaloidal reactions cannot be due to such bodies as the amino-acids—glycocoll, leucine, and asparagine, or to tyrosine, since they are not precipitated in acid solution by alkaloidal re-

agents, nor do they evolve ammonia in contact with an aqueous alkali. On the other hand, it is quite probable that the reactions must be attributed to some basic degradation products of the proteid, which cannot as yet be more exactly defined, and which themselves readily undergo further decomposition into simpler substances.

(*B*) This second portion of the original liquid, freed from colouring matter by means of lead subacetate, was precipitated by a concentrated solution of tannic acid. On the first addition of the reagent a whitish precipitate was formed, which soon changed to a resinous, sticky mass, and became redissolved to a considerable extent until a large excess of tannin had been added. On account of its solubility in the tannin solution a complete separation of the substance thus precipitated could not be effected. The liquid, however, was decanted, the precipitate washed with a little water, and subsequently treated with hot water, in which it was soluble. This hot solution was mixed with lead carbonate, and the mixture repeatedly evaporated on a water-bath until the liquid was free from tannin. The dry powder was then brought into a Soxhlet and extracted with strong alcohol. A dark-coloured liquid was thus obtained, which was allowed to evaporate spontaneously, when a thick, uncrystallisable syrup remained. Its behaviour towards alkaloidal reagents and caustic alkalies was the same as has been previously described, and it was not considered of further interest.

The filtrate from the above-mentioned tannin precipitate was treated with lead subacetate and afterward with lead carbonate for the removal of the tannin, and the lead then removed by hydrogen sulphide and filtered. This filtrate, which had a pale yellow colour, was concentrated under diminished pressure, and placed in a vacuous desiccator. About 75 Gm. of a very thick, pale yellow syrup were finally obtained, from a portion of which, after standing for a considerable time, a few colourless crystals were observed to separate, which possibly consisted of the glucoside syringin, but they could not be separated. The syrup, when diluted with a little water, was found to be strongly dextrorotatory, and was not precipitated by potassium-mercuric iodide, but by some of the other alkaloidal reagents. It was shaken out with several portions of chloroform, but the latter liquids on evaporation left simply a very small amount of an oily residue, from which water extracted no crystalline substance.

The syrupy liquid was then oxidised at the ordinary temperature

with a cold saturated solution of potassium permanganate with the hope of obtaining the so-called *gluco-syringic acid*, $C_{15}H_{20}O_{10}$, since this substance, as previously observed, is obtained by the oxidation of syringin, and by hydrolysis is converted into syringic acid and glucose. Among the products of oxidation, however, there was found only *oxalic acid*, and, by extracting the acidulated liquid with ether, a crystalline substance which, after re-crystallisation from glacial acetic acid, melted at 185° C., and had all the properties of *succinic acid.*

With the same purpose in view of obtaining, if possible, the above-mentioned glucoside acid, an extract was prepared from about 250 Gm. of Robinia bark by boiling it with water, and purifying the liquid by means of basic lead acetic. When concentrated under diminished pressure it formed a thick syrup, which did not reduce Fehling's solution until after boiling with hydrochloric acid. The syrupy liquid was oxidised with cold potassium permanganate, as above described, and the acidulated liquid extracted several times with ether. The ethereal solution, which had a strong smell of acetic and the higher fatty acids, likewise afforded chiefly *oxalic and succinic acids.* The succinic acid, after being re-crystallised from glacial acetic acid, was readily identified, not only by its qualitative reactions, but by its melting point of 184° C., and by the analysis of its silver salt, which gave the following figures: 0·0743 Gm. of the salt gave, on ignition, 0·0481 Gm. of silver, or 64·7 per cent. Ag. $Ag_2C_4H_4O_4$ requires 65·1 per cent. Ag.

The Resins.

In the first part of this paper it was noted that the original alcoholic extract of the Robinia bark contains a considerable amount of resin and fatty matter, which was separated by the addition of water. This crude product was treated first with petroleum spirit, which extracted a quantity of very dark-coloured, soft resin and fatty matter. The portion undissolved by the petroleum spirit was dissolved in warm alcohol, and the concentrated solution poured into a large volume of water acidulated with sulphuric acid, when the resin separated in a flocculent form, and, after being washed and dried, could be reduced to a fine, brown powder. The yield of soft resin was 86 Gm., or 1·23 per cent. of the weight of the bark; the yield of dry, powdered resin was 37 Gm., or 0·53 per cent. of the weight of the bark.

After distilling off the alcohol from that portion of the above

crude resin that had been dissolved in it, it was observed that the liquid in the flask became quite gelatinous when cold. Before it was poured into water, therefore, it was again extracted with petroleum spirit (b.p. 40–60° C.) by shaking in a separator. The latter liquid left on evaporation a soft, fatty matter, which was found to be completely soluble in hot alcohol. On treating this solution with a little animal charcoal, and filtering while hot, there separated on cooling a mass of nearly white substance, which, however, when spread on glass and allowed to dry in a vacuous desiccator, became of a dark slate-blue colour. It was completely soluble in chloroform, and the filtered solution left a residue which, after drying *in vacuo* over sulphuric acid and solid paraffin, had a melting point of about 75° C. On analysis it gave the following figures:—

0·1458 Gm. of substance gave 0·3816 Gm. of CO_2 = 71·4 per cent. C. and 0·1466 Gm. H_2O = 11·2 per cent. H.

This result was sufficient to prove that the substance in question is not a paraffin nor an alcohol similar, for example, to cholesterol. It was probably a mixture of bodies, and had the general properties of a *wax*.

The dry resin obtained by precipitation with acidulated water is soluble in glacial acetic acid and also in solutions of the alkali hydrates, from which it is again precipitated on the addition of water. When heated with acetic anhydride no crystallisable acetyl derivative could be obtained.

10 Gm. of the resin were brought into 50 Gm. of solid potassium hydroxide in a state of fusion, and the mixture kept at that temperature for a few minutes. The very dark-coloured mass had a phenolic odour, and, when taken up with water and an excess of sulphuric acid added, a black resin was separated, while at the same time an almost intolerable odour was developed, reminding of that of skatol, and which was possibly due to some derivative of the latter. The liquid was then distilled, and the strongly acid distillate, which had the same unpleasant odour, was neutralised with barium carbonate, but after filtering and evaporating the liquid this odour disappeared. To the concentrated solution of the barium salt a little alcohol was added, when a small amount of a crystalline salt was precipitated. This, when dried at 120–130° C., was analysed with the following result: 0·2652 Gm. of the salt gave 0·2364 Gm. $BaSO_4$ = 52·42 per cent. Ba. The acid in question was therefore essentially *acetic acid*, since barium acetate requires 53·7 per cent. Ba. This was also confirmed by the forma-

tion of the acetic ester. On the further addition of alcohol to the filtrate from the barium acetate an amorphous salt was obtained which was not suitable for analysis, but which when heated with a little alcohol and sulphuric acid developed the fragrant odour of the esters of the higher fatty acids. The liquid remaining after the distillation of the volatile acids was shaken out with ether, but this afforded no crystallisable or well-defined substance.

The Leaves of Robinia Pseud-Acacia.

The leaves of the Robinia have been stated to produce poisonous effects when eaten (Blyth, *Poisons*, 3rd Edit., 1895, p. 465), but, as noted in my previous paper (*Pharm. Rundschau*, New York, 1890, p. 30), it has been recorded in several of the older works that they afford wholesome food for cattle, and may even be used as a substitute for clover. These conflicting statements render it doubtful whether the leaves really possess poisonous properties. A few experiments recently made with them may therefore be mentioned here.

200 Gm. of the fresh leaves, collected in the latter part of May, were digested with cold water. The filtered liquid, which contains considerable mucilage, was not coagulated by heat, nor, when acidulated with hydrochloric acid, was it precipitated by any of the alkaloidal reagents. A microscopical examination of the leaves also failed to show the presence of any soluble proteid, such as exists in Robinia bark.

10 Gm. of the air-dried leaves, in the form of powder, were digested with Prollius' fluid, the liquid filtered, evaporated, and the residue taken up with acidulated water. This also afforded no indication of the presence of an alkaloid.

Although these chemical tests are of a negative character, in so far as the presence of a soluble proteid or alkaloid is concerned, a more decisive answer to the question would be afforded by some simple physiological experiments, which the writer has been unable to accomplish.

Conclusion.

In view of the somewhat extended experimental details of the present investigation, it would seem desirable to briefly summarise some of the observations included therein, and the deductions that may be made from them.

(1) The poisonous proteid—*robin*—the chemical characters of which have now been more fully described, possesses the following

general properties. It has an acid reaction, is soluble in water and in salt solutions, and is precipitated from its solution by acids. On heating its aqueous solution it becomes coagulated, although not at a uniform temperature, the largest amount being precipitated between 70 and 80° C.; at the temperature of a water bath its toxic action is completely destroyed. It affords all the colour reactions of albuminous bodies, and is precipitated by all the commonly-employed reagents. The ash obtained by the ignition of the precipitated proteid contains a considerable amount of iron. All of these reactions appear to be in complete accordance with the accepted characters of a *nucleo-proteid.*

The proteid, when prepared by precipitating a cold concentrated aqueous infusion of the bark with strong alcohol, has furthermore the properties of an enzyme, or contains such a body associated with it. Inasmuch as it is capable of affecting the hydrolysis of both amygdalin and potassium myronate, with the formation respectively of bitter almond oil (*i.e.*, benzaldehyde and hydrocyanic acid) and mustard oil, it appears to resemble the ferment *myrosin.* Like the rennet ferment it is capable of coagulating the casein of milk, and, as has been recently shown by Dr. Carl Lau (*loc. cit.*), the other toxic proteids—ricin, abrin, and crotin—likewise possess this property, as also of agglutinating or clotting the red corpuscles of the blood of certain animals.

(2) The bark contains one or more substances of an alkaloidal nature, which are easily decomposed, even by so weak an alkali as silver hydroxide, with the evolution of ammonia and small amounts of an amine. Although these bodies cannot at present be more definitely defined, owing to the difficulties of their isolation in a pure state, it is very probable that they represent degradation products of the proteid.

No direct evidence has been afforded by the present investigation of the presence of choline in the bark, although the possibility of its presence among the other basic substances is not necessarily excluded.

(3) By the hydrolysis of an extract of the bark with hydrochloric acid, a small amount of a crystalline substance has been obtained, agreeing in composition, melting point, and other properties with *syringic acid*, $C_9H_{10}O_5$, together with a red, amorphous substance corresponding to *syringenin.* There is likewise formed by the hydrolysis a dextro-rotatory sugar, the osazone of which has a melting point agreeing with that of *d*-glucose. These related facts would seem to indicate the presence in the bark of the glucoside

syringin, $C_{17}H_{24}O_9$. On the other hand, it may be observed that syringic acid is not a product of the direct hydrolysis of syringin, but is formed by the hydrolysis of an intermediate substance resulting from the oxidation of syringin—namely, *gluco-syringic acid*, $C_{15}H_{20}O_{10}$, and there is therefore the possibility that this latter substance may also pre-exist in the bark. Although this can only be determined by the isolation of the initial substances, it may be mentioned that in all the operations for the extraction of the substances from Robinia bark, every precaution was taken to prevent oxidation by evaporating the solutions under diminished pressure.

(4) The bark contains, furthermore, a small amount of tannin, some amorphous colouring matter, a sugar—probably *d*-glucose—and a considerable amount of fatty matter and resin. The resin, as previously shown, is devoid of any marked physiological action, and also possesses no special chemical interest.

In the latter part of this investigation I have been kindly assisted by Dr. H. A. D. Jowett and Mr. F. H. Lees, of the laboratory staff, to whom my thanks are due.

THE WELLCOME CHEMICAL RESEARCH LABORATORIES.

The discussion on the preceding and following papers took place after the discussion on the latter, which in the absence of the author was read in abstract by Dr. POWER.

THE ANATOMY OF THE BARK OF ROBINIA PSEUD-ACACIA, LINNE.

(*False Acacia or Common Locust.*)

By PIERRE ÉLIE FÉLIX PERRÉDÈS, B.Sc., F.L.S.
Pharmaceutical Chemist.

INTRODUCTORY.

This investigation on the bark of the common locust was undertaken at the suggestion of Dr. F. B. Power, who thought that a more detailed study of its structure than had hitherto been attempted would be desirable, especially in connection with his renewed chemical investigation of the inner bark of this tree.

Robinia Pseud-acacia, Linné (*Eng.*: False Acacia or Common

Locust;[1] *Fr.*: Robinier, Faux-Acacia; *Germ.*: Gemeine Robinie, Akazie), N.O. *Leguminosæ*, is a handsome, long-lived tree, native of North America, extending from Pennsylvania to Northern Georgia. It is stated by Michaux[2] that it was one of the first trees introduced into Europe from the forests of North America, east of the Mississippi, and that the seeds were received from Canada by John Robin, herbalist to Henri IV. of France, and cultivated by him on a large scale about the year 1601. According to others, the seeds were sent to Vespasian Robin (son of the preceding), who was arborist to Louis XIII., and were planted by him in the *Jardin des Plantes* in Paris, in 1635.[3] It will be seen that the name "Robinia" given to the genus has reference to these historical associations. Since the period referred to, this tree has become extensively propagated, and is now well known in France, England, and Germany.

General Features of Robinia Bark.[4]

The bark under examination consists of flexible longitudinal strips 1·5 to 2 mm. thick (Fig. 1), and of a pale yellow colour. It is entirely composed of inner bark (bast tissue), the outer surface showing shallow longitudinal depressions, due to the removal of the outer bark (*dep.*, Fig. 1). The inner surface is marked with slight, smooth, longitudinal striations, while under a lens innumerable longitudinally extended small dark lines are visible, these being due to the bast fibres; it is frequently crossed by transverse wrinkles (*wr.*, Fig. 1). The bark is exceedingly fibrous, breaking with difficulty and showing a laminated fibrous fracture (*lam.*, Fig. 1); the radial longitudinal cut surface shows protruding threads of fibre-groups when frayed (*f.t.*, Fig. 1); some of these threads also occur scattered over the outer surface where the outer bark has been peeled off (*f.t.*, Fig. 1).

The transverse section shows, under a lens, a decussating arrangement of white lines, the radial lines being due to the medullary rays and the tangential ones to bast parenchyma and

[1] Also known as common acacia, bastard acacia, thorn acacia, North American locust, and North American locust-acacia.

[2] *North American Sylva*, Vol. II., Philadelphia, 1859, p. 92.

[3] According to Baron Ferd. von Mueller, a tree raised in 1635 in the Paris *Jardin des Plantes* was still alive at the time of his writing, and another planted in 1721 at Britz, near Berlin, was still in a very flourishing state. ("Select Extra-tropical Plants readily eligible for Industrial Culture or Naturalisation." Melbourne, 1895, p. 467.)

[4] These refer only to the fully developed and dry bark.

sieve-tissue: on closer examination it is seen that at fairly regular intervals some of the tangential lines are wider than the others (*w.l.*, Fig. 2); the cause of this will be noticed later on. Owing to this distribution of the tissues the bark is easily split into thin laminæ.

In the sketch a piece is shown to which the brownish outer bark was still attached (*o.b.*, Fig. 2); this also consists of bast tissue, the cortical portion having been thrown off at this stage—that this is so is shown by the fact that the bast-rays extend right up to the outer limit of the bark. This outer bark is traversed by tangential bands of cork (periderm), which appear as darker rings (*per.*, Fig. 2).

The inner bark has a bean-like taste, and, although odourless when dry, it develops a very pronounced bean-like smell when moistened.

Anatomical Examination.

The young bark in which periderm has begun to form shows the following general features in transverse section (Fig. 3):—

The outline is wavy. The outer layer consists of an epidermis (*ep.*, Fig. 3), composed of slightly tangentially elongated tabular cells; this is subtended by a discoloured collenchymatous hypoderma, usually 1½ cells thick in the furrows, but several cells thick in the ridges (*hyp.*, Fig. 3). The cells in the furrows are two or three times as large as those of the epidermis, and elongated in the same direction; those in the ridges are isodiametric, smaller, and have thicker walls. Following upon this is the periderm, or cork (*per.*, Fig. 3), which is seen to have arisen in the second hypodermal layer, inasmuch as the cells of the second layer below the epidermis have an outer half similar in every respect to the cells of the first hypodermal layer, while the inner half is identical with the cells of the subjacent cork. The periderm (cork) consists of tangentially elongated tabular and thin-walled cells, limited internally by the phellogen layer (*phell.* Fig. 3). This layer is followed by cortical tissue consisting of collenchyma two or more cells thick (*coll.*, Fig. 3), passing gradually into ordinary cortical parenchyma (*cort.*, Fig. 3), consisting of thin-walled and tangentially elongated cells. The pericyclic fibres (*pc.f.*, Fig. 3) are arranged in semilunar masses around the primary bast-bundles, and have associated with them, externally, sacs containing prismatic crystals of calcium oxalate (*cryst.*, Fig. 3). Gaps usually occur between the fibre-masses, and these are filled up by means of one or two rows of stone

cells (*sc.*, Fig. 3). The bast (*Ba.*, Fig. 3) contains sacs filled with tannin (*tan.s.*, Fig. 3), these being arranged in a more or less regular ring. Details of the fibres are shown in Figs. 4 and 5 a and b. The portion occupying the position of the middle lamella is lignified (*m.l.*, Fig. 4), staining red with phloroglucin and hydrochloric acid, and yellow with iodised chloride of zinc. The remainder is gelatinous in appearance and not lignified, staining violet with Schulze's solution; it is generally separated into two layers, the inner one being frequently distorted, as shown in Fig. 4.

Transverse sections of the tannin sacs are shown in Figs. 6 a, b, c, d, and a longitudinal one in Fig. 7. From these it will be seen that in transverse section the sacs are usually somewhat tangentially elongated. The greatest elongation takes place, however, in an axial direction, the sacs being from six to eight times as long as broad. The contents are stained black by ferric chloride.[1]

A transverse section through an older piece, in which the secondary bast fibres have begun to form, is shown in Fig. 8. It differs essentially from the former in that growth in thickness has been accompanied by tangential extension in the tissues of the outer portion. The following are the main points of difference, *seriatim.* The cork layer has increased in thickness, while the hypodermal tissue has been cast off. The cortical cells, collenchymatous and thin-walled, have become tangentially elongated, and have divided by radial walls. The pericyclic fibre-groups have become more widely separated, and additional stone cells (see *sc.*, Fig. 8) have been formed to complete the ring. The pericyclic fibres have become more thickened. The tissues subtending the pericycle have also been extended tangentially, radial divisions having evidently taken place in the parenchymatous cells situated under the added stone cells. A broken ring, consisting of strands of secondary bast fibres (*b.f.*, Fig. 8), interrupted by the medullary rays, has been formed in close proximity to the tannin sacs. Differentiation of secondary sieve-tissue (*s.t.*, Fig. 8) and bast parenchyma (*b. par.*, Fig. 8) has taken place, together with that of additional medullary rays (*m.r.*, Fig. 8).

The bark which was employed for chemical investigation by

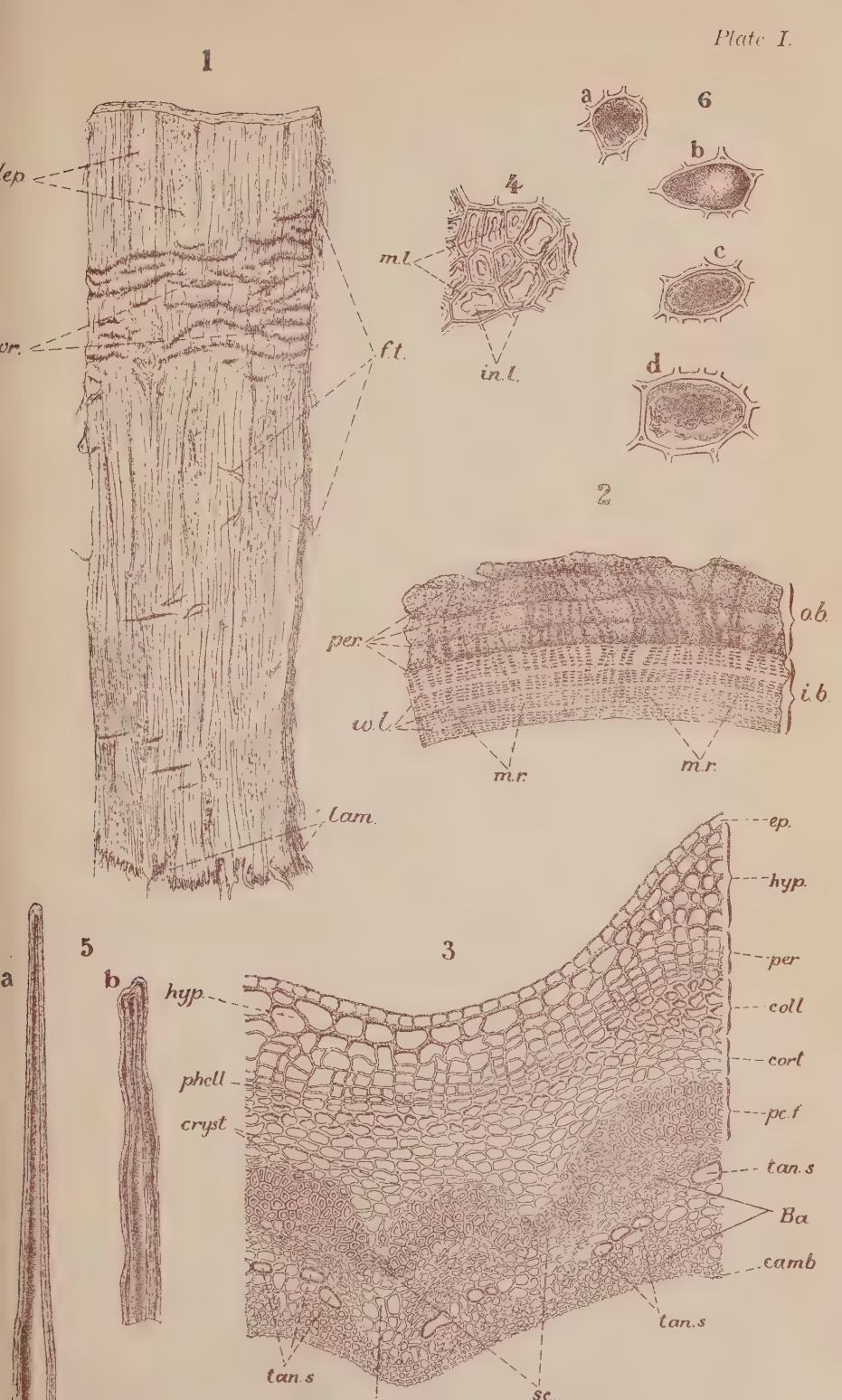
[1] For further details concerning these, see De Bary, *Comparative Anatomy of the Phanerogams and Ferns*, p. 153, and Baccarini, *Apparecchio albuminoso-tannico delle Leguminose* in *Malpighia*, Vol. VI., 1892, pp. 255, 325, 537, *et seq.* Plates XXI.–XXVI.

Dr. Power will be next considered. The outer bark had been stripped off almost completely. One or two pieces, however, were found with strips of this still attached, and, for the sake of completeness, will be introduced in the description.

The outer bark (*o.b.*, Figs. 2 and 9)—that is to say, the tissues extending from the last-formed phellogen to the periphery—constitutes about half the thickness of the whole bark (see Fig. 2). It is composed entirely of dead bast tissue traversed by tangential bands of tangentially elongated tabular cells, consisting of dead phellogen layers associated with the tissue formed from them (*per.* (*i*), Fig. 9), the latter being always directed towards the exterior (periderm). The walls of all the parenchymatous cells are more or less disorganised and crumpled, and have undergone suberisation or lignification. The fibre-groups (*b.f.*, Fig. 9) are also lignified, while the remains of the sieve-tissue (*c.s.t.*, Fig. 9) appear as compact brown tangential strands. After making allowance for the presence of successive phellogens and of periderm, for the expanded outer portion of the medullary rays, and for the distortion of the tissues due to disorganisation, the general arrangement is similar to that of the inner bark or living portion, of which the following is a description:—Externally we observe a phellogen (*phell.*, Fig. 9), which has originated in the cells of the bast parenchyma and of the medullary rays. This has given rise externally to periderm (*per.* (*ii*), Fig. 9), arranged in regular radial rows, as noted above. The remainder of the bark consists of bast rays (*ba.r.*, Fig. 9), remarkably uniform in width from phellogen to cambium, separated by medullary rays usually three or four cells wide (*m.r.*, Fig. 9).

The bast rays, as seen in transverse section, consist, in the outer portion, of tangential masses of fibres alternating with bast parenchyma and collapsed sieve-tissue (*c.s.t.*, Fig. 9); as the cambial region is approached, however, the elements of the sieve-tissue assume their original outline more or less completely (*s.t.*, Fig. 9). In the external and middle portions of the bark the width of the fibre-masses is, in most cases, approximately equal to that of the bast parenchyma and sieve-tissue; this holds true also, although to a rather less extent, in its inner portion, the fibre-masses being relatively thinner there; at intervals, however, this arrangement is disturbed, owing to a copious development of tangential bands of sieve-tissue (*w.a.*, Fig. 9), these giving rise to the wider tangential lines in the transverse section of the bark seen under a lens.

Further particulars of the preceding will now be given:—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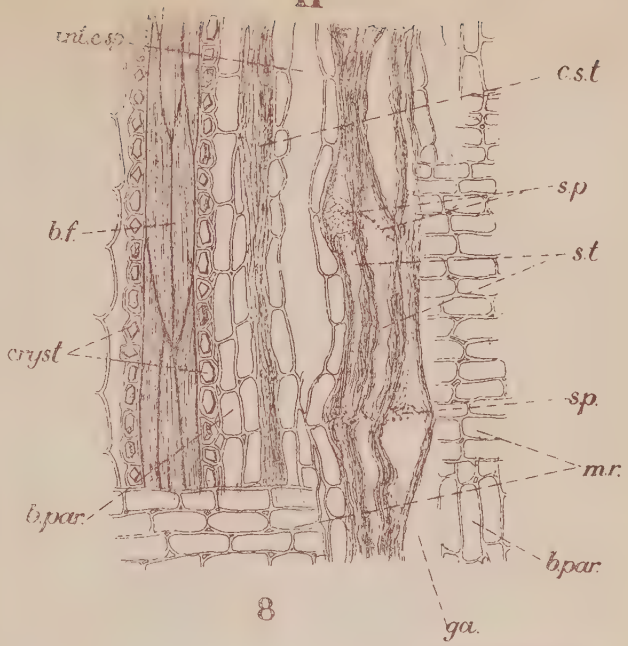
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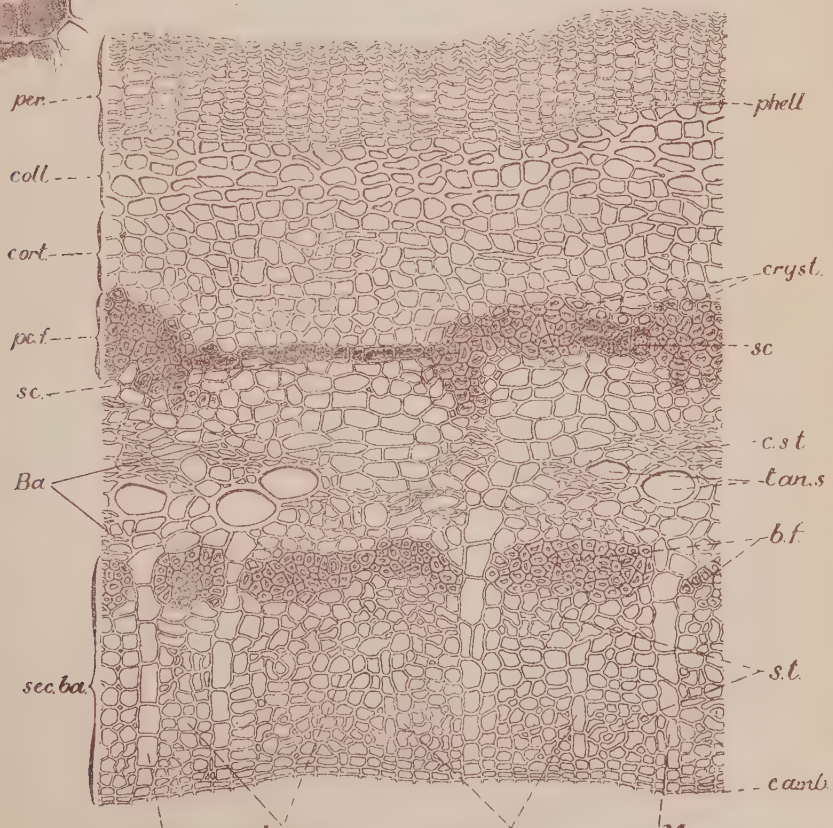
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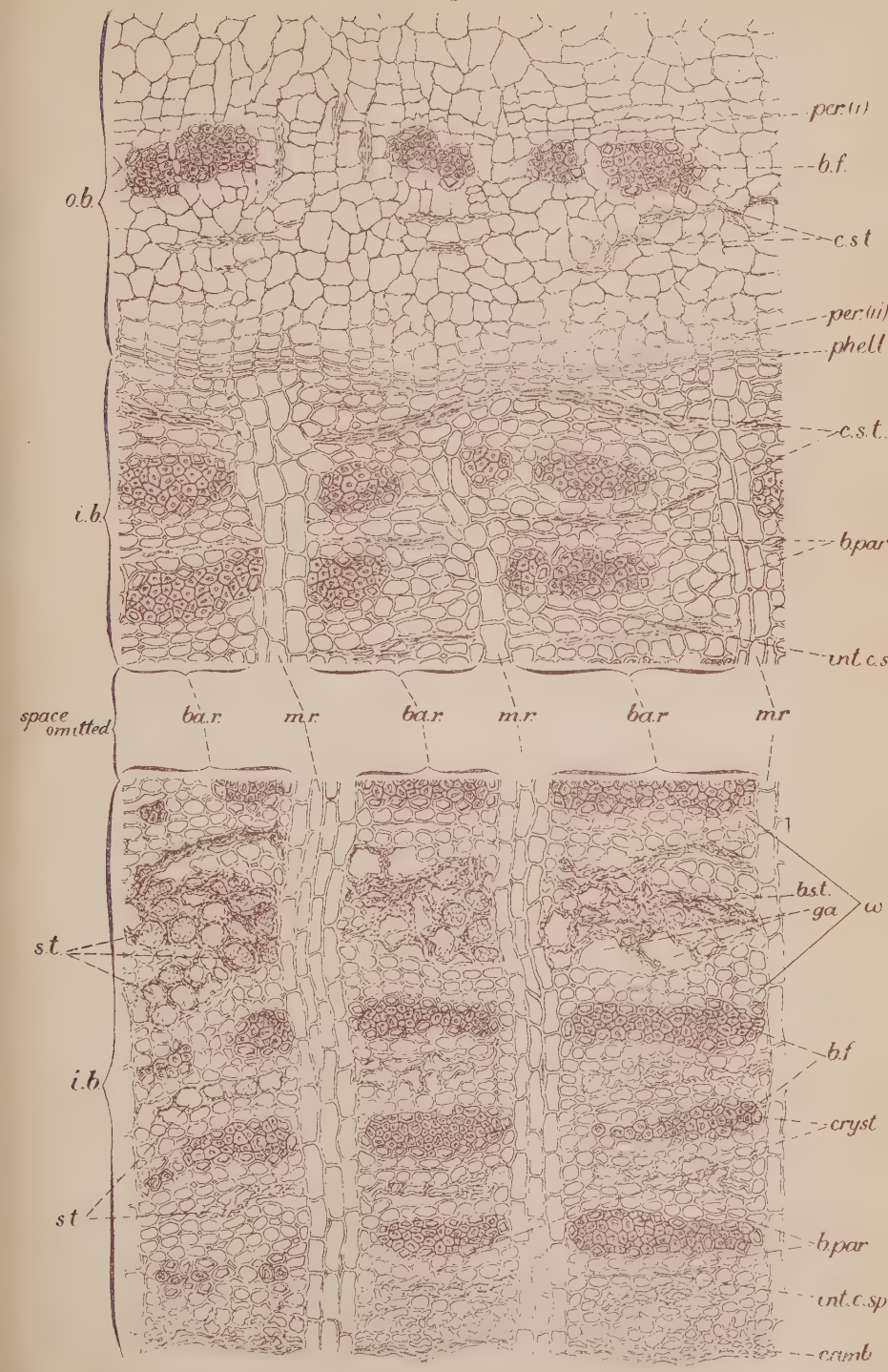
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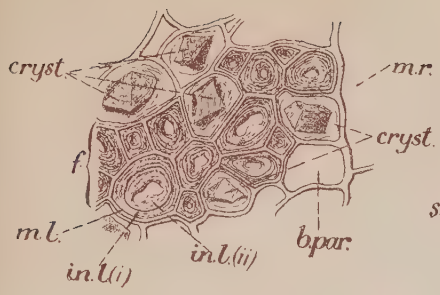

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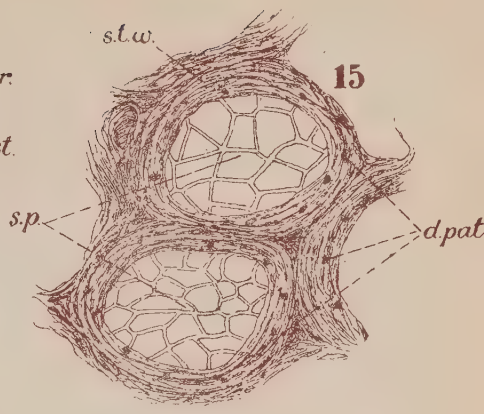

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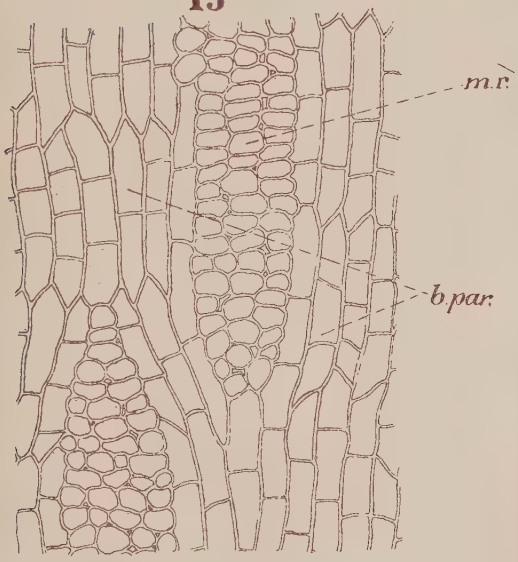

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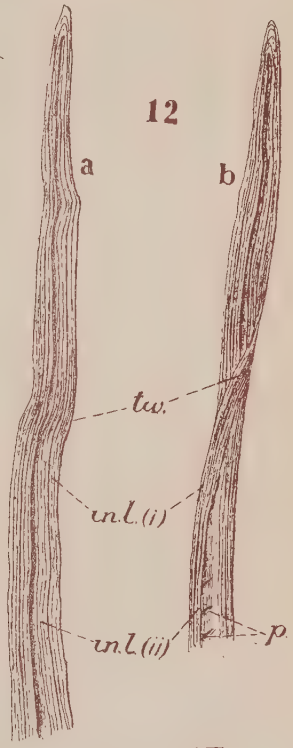

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1. *The Fibre-masses* are generally from 2 to 4 fibres thick and are encased in a sheath of crystal-containing sacs (*b.f.* and *cryst.*, Fig. 9); details of the elements of such a group are shown in Figs. 10, 11 and 12. The fibres as seen in transverse section (see Fig. 10) are polygonal in outline and more or less isodiametric, the middle lamella (*m.l.*, Fig. 10) is lignified, the remainder (*in.l.*, (*i*) and *in.l.*, (*ii*), Fig. 10) is not, but is much thickened, gelatinous in appearance, and shows numerous distinct concentric striæ, with usually a very conspicuous one about half-way between the middle lamella and the internal limit; in the younger fibres the inner layer is less thickened and is distorted in a similar way to that of the pericyclic fibres shown in Fig. 4. In a radial longitudinal section the fibres, at first sight, appear to be very short and fusiform (*b.f.*, Fig. 11); on isolation this is seen to be due to the intertwining of these elements (*tw.*, Figs. 12a and 12b); in this they differ from the pericyclic fibres, which are nearly straight (see Figs. 5a and 5b), although of approximately the same length.

The lateral fibres of the fibre-masses may or may not abut directly on the medullary rays (see Figs. 9 and 10).

The crystal-containing sacs (*cryst.*, Figs. 9, 10 and 11), are polygonal in outline and roughly isodiametric in all directions; they contain prismatic crystals of calcium oxalate, which are usually solitary and enveloped in a thin membrane.

In tangential longitudinal section the fibre-masses form a network, the meshes of which curve round the medullary rays.

2. *The Bast Parenchyma* consists of thin-walled parenchymatous cells, which, in transverse section, are seen to be somewhat elongated tangentially and rounded in outline (*b. par.*, Fig. 9); the greatest elongation occurs, however, in an axial direction (see Figs. 11 and 13). The origin of these cells by transverse division and growth of cambial cells is indicated in a tangential longitudinal section (Fig. 13), where the roof- or V-shaped ends of the parent cells are very evident; their walls are furnished with simple pits, the thickened portions of the wall frequently showing the appearance represented in Fig. 14, in a chloral-hydrate mount. Intercellular spaces, extending in longitudinal-tangential direction if large, occur in this tissue (*int.c.sp.*, Figs. 9 and 11).

3. *The Sieve-tissue.* In transverse section the collapsed sieve-tissue appears as tangential strands situated about half-way between the fibre-masses and having a hyaline striated appearance (*c.s.t.*, Fig. 9). Sieve-tubes in process of collapse are also shown, in transverse section, in the lower part of Fig. 9, which represents

the inner portion of the bark; in the wide area where they are most abundantly developed, they have, in most cases, broken off from the surrounding parenchyma, leaving irregular gaps (*ga.*, Fig. 9), and the whole mass has a hyaline highly-refractive jelly-like appearance, dotted with darker patches when treated with iodised chloride of zinc. In the wider area just mentioned the sieve-tubes are frequently more or less intact, and show the transverse sieve-plates very distinctly (Fig. 9, *s.t.* and Fig. 15); they are more or less circular in outline and have gelatinous walls, which, like the above-mentioned broken-down mass, show darker spots when treated with Schulze's solution (Fig. 9 and *d.pat.*, Fig. 15); in radial longitudinal section it is seen, further, that the sieve-tubes are shortly segmented, the segments being but three or four times as long as the cells of the bast parenchyma (Fig. 11). In the vicinity of the cambial region the sieve-tube walls are less thickened, although they still retain their jelly-like appearance (see Fig. 9).

4. *The Medullary Rays.* The cells of the medullary rays are thin-walled, tabular, and elongated in a radial direction, being radially extended when seen in transverse and in radial longitudinal sections (*m.r.*, Figs. 9 and 11), and approximately isodiametric in tangential longitudinal section (*m.r.*, Fig. 13). The medullary rays themselves are usually from three to four cells wide, as has already been stated, and about twenty cells deep, on the average, although they may be as little as two or as much as over fifty deep.

Cell-Contents.

The contents of the elements of the outer bark consist mostly of brown colouring matter blackened on treatment with ferric chloride.

The fibres of the inner bark have few contents, if any, and those of the sieve-tubes are slight.[1]

The cells of the medullary rays and those of the bast parenchyma are, on the other hand, filled with proteid material giving the usual colour reactions with iodine and with Millon's reagent, that with the latter reagent being particularly striking; details

[1] An investigation of the sieve-tube contents has not been attempted in dry material such as that at present under examination: nor is this necessary, as the subject has been fully worked out by Strasburger in *Ueber den Bau und die Verrichtungen der Leitungsbahnen in den Pflanzen*, Jena, 1891, pp. 166–200, and also by Baccarini in *Malpighia*, Vol. VI., 1892, pp. 53–57 and Plate IV. ("Intorno ad una particolarità dei vasi cribrosi nelle Papilionacee").

are shown in Figs. 16–18. In Fig. 16 the action of alcohol is represented. The section from which Figs. 17a and 17b were sketched, had been treated with Schulze's solution; here the contents, although somewhat shrunken, have a fairly plump and well-fed appearance, the lighter areas (*hyd.*) are vacuoles (these, with their bounding membranes, constitute the *Hydroleucites* of Van Tieghem). Figs. 18a and 18b show the effects of Millon's reagent; the contents in this case are shrivelled up into a shapeless mass.

Starch is entirely absent, with the doubtful exception of the more darkly staining and ill-defined patches in the gelatinous sieve-tube walls; that these are due to starch is improbable, as no colour is developed with iodine alone or even with chloral-hydrate and iodine. The gelatinous matrix itself is more deeply stained by iodised chloride of zinc than the walls of the surrounding parenchymatous cells, and it is quite possible that these darker patches may be due to a difference in the alteration of the cellulose of the sieve-tube wall.

All the parenchymatous cells of the younger barks shown in Figs. 3 and 8 contain starch; whether this would be the case in the one under consideration at a different period of the year (the present bark was collected in the spring) still remains to be shown.

It must be added, in conclusion, that the principal authorities have been laid under contribution. Among these, special mention must be made of the following: De Bary, Dr. A., *Comparative Anatomy of the Phanerogams and Ferns*, Bower and Scott's translation, Oxford, 1884; Solereder, Dr. Hans, *Systematische Anatomie der Dicotyledonen*, Stuttgart, 1899; Van Tieghem, Ph., *Traité de Botanique*, Paris, 1891.

NOTE.—The term "bark" has been used in its ordinary English signification: for a justification of this, see Prof. H. G. Greenish's *Introduction to the Study of Materia Medica*, London, 1899.

The following words taken from MM. Planchon and Collin's work, *Les Drogues Simples d'Origine Végétale*, may be also quoted in connection with the nomenclature of barks in Materia Medica: *Les écorces n'ont plus pour les botanistes modernes la même signification qu'autrefois . . . C'est jusqu'au cambium que l'on étendait jadis les couches corticales et c'est dans ce sens que nous sommes bien forcés de les accepter encore dans nos études de matière médicale. Quand une écorce est détachée du tronc, c'est dans la couche cambiale . . . que se fait spontanément la*

séparation ; si bien que toutes les écorces officinales . . . contiennent les faisceaux libériens.[1]

Explanation of Figures.

Fig. 1. (*Plate I.*) Inner bark, outer surface ; *f.t.*, protruding fibrous threads ; *dep.*, shallow longitudinal depressions ; *lam.*, laminated fibrous fracture ; *wr.*, transverse wrinkles (these are much more numerous on the inner surface). Natural size.

Fig. 2. (*Plate I.*) Transverse section through entire bark ; *o.b.*, outer bark ; *i.b.*, inner bark ; *per.*, tangential bands of cork in outer bark ; *w.l.*, wider tangential lines occurring at intervals in inner bark ; *m.r.*, medullary rays. × 8 diameters.

Fig. 3. (*Plate I.*) Transverse section of bark from a young twig 4 mm. thick ; *ep.*, epidermis ; *hyp.*, hypoderma, many cells thick in ridges, usually 1½ cells thick in furrows ; *per.*, periderm ; *phell.*, phellogen ; *coll.*, collenchymatous portion of cortex ; *cort.*, portion of cortex, consisting of thin-walled parenchyma ; *pc.f.*, semilunar masses of pericyclic fibres ; *cryst.*, crystal sacs with crystals ; *tan.s.*, tannin sacs ; *Ba.*, bast ; *sc.*, stone cells ; *M.r.*, medullary ray ; *camb.*, cambium. × 150 diameters.

Fig. 4. (*Plate I.*) Pericyclic fibres in transverse section ; *m.l.*, lignified portion of wall, the remainder being gelatinous in appearance, not lignified, and frequently with an inner distorted half (*in.l.*) × 300 diameters.

Figs. 5a and 5b. (*Plate I.*) Portions of pericyclic fibres isolated by maceration ; a, about a third, and b, a quarter of a fibre. × 300 diameters.

Figs. 6a, b, c and d. (*Plate I.*) Transverse sections of tannin sacs. Material preserved in alcohol, sections mounted in glycerin. × 300 diameters.

[1] The following translation of this passage, though not a strictly literal one, will, I hope, be found to represent the exact sense of the original :—

To modern botanists the term "bark" no longer possesses its former meaning. . . . The layers constituting the bark were formerly considered to extend to the cambium, and it is in this sense that we must still continue to regard them in our study of Materia Medica. When a bark is removed from the trunk, it is in the cambial layer . . . that the separation spontaneously occurs ; so that all the officinal barks . . . contain the bast bundles.

FIG. 7. The same in longitudinal section. × 300 diameters. (*Plate II.*)

FIG. 8. (*Plate II.*) Transverse section of bark from an older twig about 6·5 mm. in diameter: *c.s.t.*, collapsed sieve-tissue; *sec. ba.*, secondary bast; *b.f.*, fibre-groups of secondary bast; *s.t.*, sieve tissue; *b. par.*, bast parenchyma; *m.r.*, new medullary rays; other lettering as in FIG. 3. × 150 diameters.

FIG. 9. (*Plate III.*) Transverse section through portion of bark shown in Fig. 2; *o.b.*, inner portion of outer bark; *i.b.*, inner bark; *ba.r.*, bast rays; *m.r.*, medullary rays; *per.* (*i.*), disorganized phellogen and periderm; *phell.*, phellogen; *per.* (*ii.*), periderm in course of formation; *b.f.*, groups of bast fibres; *c.s.t.*, collapsed sieve-tissue; *b.par.*, bast parenchyma; *int.c.sp.*, intercellular space; *w.a.*, wider area with copious development of sieve-tissue; *s.t.*, sieve-tubes with gelatinous walls and conspicuous transverse sieve-plates; *b.s.t.*, sieve-tissue breaking away from the surrounding bast parenchyma; *ga.*, gap caused by the breaking down of the sieve-tissue; *cryst.*, crystal sacs; *camb.*, cambial region. × 150 diameters.

FIG. 10. (*Plate IV.*) Transverse section through portion of fibre group; *f.*, fibres with a lignified outer portion (*m.l.*) and a gelatinous inner portion (*in.l.* (*i.*) and *in.l.* (*ii.*)) showing a striated appearance (note the conspicuous middle stria dividing the inner portion into two halves (*in.l.*(*i.*)) and (*in.l.* (*ii.*)); *cryst.*, crystal sacs showing crystals of calcium oxalate enveloped in a thin membrane; other lettering as in Fig. 9. × 400 diameters.

FIG. 11. (*Plate II.*) Radial longitudinal section through one of the wider areas of Fig. 9; *s.p.*, sieve-plates; other lettering as in Fig. 9. × 150 diameters.

FIGS. 12a and b. (*Plate IV.*) Portions of fibres of secondary bast, isolated by maceration; *tw.*, twist in fibre; *p.*, pits; other lettering as in Fig. 10. × 400 diameters.

FIG. 13. (*Plate IV.*) Tangential longitudinal section passing through the bast parenchyma. Lettering as in previous figures. × 150 diameters.

FIG. 14. (*Plate IV.*) Cell-wall of bast-parenchyma cell in tangential longitudinal section, treated with chloral-hydrate; *th.* thickenings of the wall. × 400 diameters.

FIG. 15. (*Plate IV.*) Sieve-tubes in transverse section showing the conspicuous sieve-plates (*s.p.*); *s.t.w.*, gelatinous sieve-tube wall; *d.pa.*, darker patches in sieve-tube wall. Section treated with Schulze's solution. × 500 diameters.

FIG. 16. (*Plate IV.*) Cell of medullary ray with contents, showing action of alcohol (not a very satisfactory preparation). × 400 diameters.

FIGS. 17a and 17b. (*Plate IV.*) Cells of bast parenchyma with contents, treated with Schulze's solution; *hyd.*, vacuoles. × 400 diameters.

FIG. 18a. (*Plate IV.*) Cell of medullary ray and (18b.) of bast parenchyma with contents, section treated with Millon's reagent. × 400 diameters.

THE WELLCOME CHEMICAL RESEARCH LABORATORIES.

Mr. NAYLOR asked if the proteid was in solution, could the solution be passed through a porcelain tube so as to give the reactions, and could the enzyme be obtained in an isolated condition?

Dr. ATTFIELD said he was quite incompetent to enter upon any discussion of this paper. For thirty or forty years pharmacists had been regarding *Robinia pseud-acacia* as more or less of a mystery, which Dr. Power had to a considerable extent unravelled at an enormous cost of labour. They would also recognize and admire the great labours of Mr. Perrédès.

Dr. POWER said he had not made any direct experiment in the direction indicated by Mr. Naylor's question, but the ferment, the enzyme, was undoubtedly a colloid body, and could not be separated by any process of dialysis.

The PRESIDENT said these papers were rather outside the range of pure pharmaceutical discussion. The tree itself was well known, and had a habit of shedding its thorns, which made it an object of interest to all cyclists and cycle repairers; like many of the Leguminosæ, it had toxic properties, and it had affinities with the *Abrus precatorius*. There were one or two plants of the same character in Natal, the toxic properties of which were well known; they were used as fish poisons, and even as milk curdlers under certain conditions, of which they knew but little. The working

out of this subject by Dr. Power had been effected in a masterly way, and they were all grateful to him and also to Mr. Perrédès for their labours.

The following two papers were then read, the discussion taking place at the conclusion of the latter:—

CHEMICAL STANDARDISATION OF GALENICAL PREPARATIONS.

By N. H. Martin, F.C.S., F.L.S.

Since the publication of the last edition of the British Pharmacopœia and the valuation for the first time of the galenical preparations of belladonna and ipecacuanha by a quantitative estimation of the alkaloids contained in them, a considerable amount of criticism has appeared in the pharmaceutical journals; and, in consequence of the success which, it is assumed, has attended the standardisation of these substances by chemical analysis, it is suggested that the method may be serviceably extended to the valuation of other substances such as aconite, stramonium, etc. I have no intention in this paper of offering any criticism or suggestion as to the minutiæ of the processes adopted in the Pharmacopœia, but I think the time is opportune for an inquiry as to whether the methods which have been adopted are certain to secure not only constancy in the strength of one particular principle, but also those most important factors—the identity of the preparation with its nominal source, and the full therapeutical value of *all* the constituents of the crude drug.

In reading the papers and remarks of the various authors who have published their experiences in connexion with this subject, one is struck by the lack of uniformity in the results obtained, and this is in all probability due to what Merck in his *Annual Report* for 1900 calls the "incalculable factor" of the varying individual interpretations of the pharmacopœial directions. Another point which must strike us in the pharmacopœial instructions is that whereas in opium and cinchona chemical tests are given for the crude drugs as well as for their preparations, and in these, as also in nux vomica, the alkaloids are required to be identified as morphine, quinine and cinchonidine and strychnine respectively, in the case of belladonna and ipecacuanha, on the other hand, the advisability of identifying the substances obtained by the processes described is not even suggested. Further, in the case of ipecacuanha, although the physical characters of the root as given

would distinctly exclude the Carthagena variety, yet a preparation from the Carthagena variety alone, or the Rio and Carthagena mixed, might easily respond to the tests for the liquid extract. With regard to the belladonna, an entirely factitious substance might easily be made to answer the chemical test as it is stated in the Pharmacopœia. Merck, in the Report to which I have alluded, says, in reference to the German Pharmacopœia tests for the extracts of henbane, belladonna, etc.: "Certain it is that it is quite as easy to adulterate an extract and yet to satisfy the requirements of the Pharmacopœia, as it is difficult, in many cases even impossible, to demonstrate the fact of adulteration." This statement, as well as the whole paper on the subject, coming as it does from a firm possessing such an extensive experience, not only in the assay of drugs of vegetable origin, but in the manufacture of a wide range of alkaloids and of active principles, is worthy of the careful and thoughtful consideration of all who have to do with galenical preparations.

The assumption underlying chemical standardisation is that there is in other drugs beside opium, nux vomica, and cinchona, some substance or substances which can be isolated, identified and estimated with the same certainty that we can separate morphine, strychnine, and quinine, and that the therapeutic activity of such drugs is due to and identical with such substances. It takes no account of the precise condition in which these substances exist or of other valuable constituents which may, and probably do, take part in the pharmacological activity of the whole. If we study the history of all vegetable drugs, we shall find that their reputation for the relief of pain or for the cure of disease preceded any knowledge of their chemical constituents, and was built up by an accumulated consensus of experience to the effect that certain results invariably followed the administration of such drugs in their crude form, or in the form of the simplest preparations—for example, extracts, infusions, etc. Cinchona bark had an established reputation long before the discovery of quinine, and even now preparations of cinchona bark have a wide field of usefulness which cannot be limited to the quinine factor alone. Digitalis and ergot are as much used to-day as ever they were, and, owing to their value and importance, no drugs have been submitted to more prolonged or capable chemical investigation, but we look in vain for an accumulation of united opinion as to the value of any of the glucosides or principles which from time to time have been announced as the active substances which would represent digitalis

or ergot. Another assumption requiring close examination is that the variation which has been observed in the activity of certain preparations is due to the natural variation of the crude drugs, and that this can be controlled by chemical assay, but in this no account has been taken of the use of drugs collected at improper times and under improper conditions, and of those which have been damaged by age and improper keeping, and have been used in the manufacture of galenical preparations because they were no longer fit for sale as crude drugs, under which circumstances changes affecting the clinical value of the drug may have occurred which could not be detected by the methods of chemical analysis. Is it unfair to assume that a manufacturing chemist who would use such samples of crude drugs would also manipulate any preparation of the drug up to the titration standard required in the Pharmacopœia by the addition, if need be, of innocuous alkaloids, or even of organic bases totally innocent in their origin of any connexion with the drug whose name was attached to the finished product?

What, then, should be the aim of the compilers of the Pharmacopœia with reference to galenical preparations of crude drugs. I think it should be, in the first instance, to enable every pharmacist to guarantee from his own knowledge the absolute identity of the finished product with its supposed source. If processes of manufacture which can only be worked economically on the large scale are introduced, and if assay methods which admit of sophisticated preparations being made to respond to the standards, are adopted; and, again, if such methods of valuation are relatively costly in time and material, this initial factor of identification is of necessity taken out of the hands of the pharmacist who should be responsible.

In the next place, I think simplicity in the processes for galenical preparations should be adopted and solutions should be made which will present to medicine fluid or solid preparations of the crude drugs, with the least possible splitting up and interfering with the activities of the substances in the precise combinations in which nature has elaborated them in the plant. To accomplish this I should avoid making preparations which are concentrated almost to saturation point with organic matter and the application to them of heat, to which many alkaloidal substances are so sensitive, and by which they are very liable to become altered. I would further suggest that crude drugs be described in the Pharmacopœia with much greater care and fulness than at present. In addition to the botanical source, the time of collection and the external characters of the drugs, and—wherever it will conduce to

greater certainty and uniformity—the microscopical characters and percentages of ash and extractive should be given. Where it is possible to indicate the activity of the drug through an investigation as to the presence of a known chemical principle, instructions for testing the crude drug should be given; where we have accumulated knowledge enough to be able to fix a certain percentage of this principle as the minimum standard of quality, it should be stated.

I think that in every case the chemical assay should be carried out on the crude drug, and if, in addition, there are certain preparations of such drug which admit of being standardised, this should be done by a process which would render the identification of the separated alkaloid a certainty. Starting with such carefully identified and assayed crude drugs, if precise instructions are given as to fineness of powder and general treatment, the preparations of tinctures, extracts, wines, etc., will not vary within limits which will interfere with their usefulness. I hope I may not be understood to undervalue or to wish to discourage the researches and discoveries of chemistry in connexion with vegetable drugs, but in the present state of our knowledge most galenical preparations are more complex than can be expressed in the terms of a chemical principle, and it is not wise or fair to the medical men who still use them to introduce misleading valuations into the pharmacopœial tests.

The Pharmacopœia might contain a very much wider range of alkaloids and of definite proximate principles than it does now, so that medical men may have their choice, and doubtless when these principles are proved by experience to fulfil all the pharmacological conditions of the crude drugs and galenical preparations, the latter will disappear by natural selection. There need be no theory about the matter, and no attempt should be made artificially to hasten the process, lest in so doing medicine lose some of its most valuable remedies.

I hope by means of this paper and the suggestions I have made to stimulate discussion, not only in this meeting, but amongst all those who are interested in galenical preparations. It will require the intelligent co-operation of a large number of practical men who may have special opportunities of observing the effects of climate, soil, seasons, age of plants, times and conditions of collection, etc., to make comprehensive experiments and investigations in the assay of crude products and especially as to the identification of isolated principles. In this way we shall accumulate the know-

ledge and be able to decide whether it is wise to continue and extend the present plan of assaying the finished preparation or whether it may not be better to apply all the tests possible—including the assay—to the crude drugs which can be identified, and to trust to careful directions and manipulation to produce preparations which, although they may vary as to strength within small limits, will, to the certain knowledge of the individual pharmacist, be free from adulteration or substitution.

The following paper, in the absence of the author, was read by Mr. HENRY GADD:—

THE STANDARDISATION OF GALENICALS.

By H. WIPPELL GADD.

So much has been written and said of late on this subject that further comment may seem superfluous. The only excuse for the publication of the following notes is that they are the result of practical work undertaken primarily for commercial purposes. Galenicals may be divided into two classes: (1) Preparations that are or can be standardised to a percentage of some definite chemical substance, which, although not necessarily the only active ingredient, is a fair index of the quality of the drug used and consequently of the finished product. (2) Preparations the active ingredient of which is unknown or cannot be readily isolated, and which can only be standardised by physical tests, such as specific gravity and percentage of extractive.

Of the first class I would say little. They are to be dealt with in another paper to be presented to this Conference. One or two points may, however, be mentioned.

Nux Vomica.—The official process for the assay of the liquid extract and tincture, modified in the light of Farr and Wright's research, gives satisfactory results. It is curious, however, to read the directions in the Pharmacopœia, according to which sixteen fluid ounces are to be made from a pound of beans, and this *strong* extract is to be suitably diluted to produce a liquid extract which shall contain 1·5 per cent. of strychnine. I have not been fortunate enough as yet to obtain a parcel of beans which contained more than half this amount of strychnine, and have therefore, of course, found it necessary to use very much more than a pound of the drug to produce a pound of the fluid extract.

Cinchona.—The official process for the assay of the preparations of this drug is satisfactory, but I have not obtained such uniformly

exact results as would lead me to condemn a sample which showed a deficiency of 0·04 per cent., as has recently been done by a public analyst.

A curious proof of the value of standardisation has come under my notice. A parcel of bark having been crushed for manufacturing purposes was stored in a room over the mill room, where the vibration caused by the machinery was felt to some extent. Portions were taken from time to time, and made into the official preparations in the ordinary way, but on analysis the results were by no means concordant with the composition of the original bark. Apparently, the constant slight vibration separated the lighter and heavier particles of the bark, and the comparatively inert from those rich in alkaloids. This result ought, perhaps, to have been foreseen, but would probably not have been noticed if the strength of the finished products had not been determined.

Belladonna.—The recommendation of Edmund White that only root containing at least 0·4 per cent. alkaloids should be used is undoubtedly a wise one, but it is somewhat difficult to obtain commercial samples of this strength. The following are results of some recent analyses :—

Sample A	contained	0·62	per cent.	of	alkaloids.
Sample B	,,	0·40	,,	,,	,,
Sample C	,,	0·48	,,	,,	,,
Sample D	,,	0·28	,,	,,	,,
Sample E	,,	0·3	,,	,,	,,
Sample F	,,	0·3	,,	,,	,,
Sample G	,,	0·35	,,	,,	,,
Sample H	,,	0·4	,,	,,	,,
Sample I	,,	0·37	,,	,,	,,

With regard to the second class of galenicals doubt has been expressed as to the utility of attempting their standardisation. As a manufacturer, however, who has adopted these methods for some time past, I can testify to their usefulness as a check on the work of the laboratories, and in three or four cases this has been particularly shown.

Tincture of Asafetida.—As it is almost impossible to get any quantity of the gum which will conform to the standard of the Pharmacopœia, it is obviously necessary to standardise the tincture, if its therapeutic efficacy is to be ensured, and the standard of 10 per cent. of extractive, which has been suggested, practically does this.

Compound Tincture of Benzoin.—In this case if the extractive

falls much below 18 per cent., it is evident that an inferior benzoin or storax, or both, have been used.

Tincture of Myrrh.—I have obtained figures for the extractive of this tincture, varying from 4·4 to 8 per cent., but generally a lower percentage than 6 per cent. would seem to be indicative of the use of an inferior gum.

Compound Tincture of Rhubarb.—Very variable results have been obtained on this tincture, depending partly on the length of time during which the solids are dried, constant weight being almost unattainable. It is essential, of course, in all cases that a uniform time of drying be adopted, and I would suggest that two hours at the temperature of the water oven be taken as the standard.

Extract Casear. Sagrad. Liq.—I have found the extractive of this preparation to vary from 20 to 27·5 per cent., but most of the samples have been near the lower limit.

Infusions.—An attempt was made to compare the B.P. concentrated liquors, and also some concentrated commercial infusions with fresh infusions by estimating the amount of extractive in each case. The results, however, are not very encouraging, as will be seen by the following figures:—

	Per Cent. Extractive.
Infusion of Orange (fresh)	1·43
" " (concentrated 1 to 7)	10
Infusion of Calumba (fresh)	0·54
" " (concentrated 1 to 7)	3·29
Liq. Calumba Conc. B.P.	4
Infusion of Cascarilla (fresh)	0·27
" " (concentrated 1 to 7)	1·96
Infusion of Cloves (fresh)	0·59
" " (concentrated 1 to 7)	2·66
Infusion of Buchu (fresh)	1·25
" " (concentrated 1 to 7)	5·47
Infusion of Digitalis (fresh)	0·28
" " (concentrated 1 to 7)	1·42
Infusion of Serpentary (fresh)	1·38
" " (concentrated 1 to 7)	8·86
Comp. Infusion of Gentian (fresh)	1·02
" " " (concentrated 1 to 7)	15·42
Infusion of Senega (fresh)	0·88
" " (concentrated 1 to 7)	8·46
Liquor Senegæ Conc. B.P.	10
Acid Infusion of Roses (fresh)	0·73
" " " (concentrated 1 to 7)	7·22
Infusion of Rhubarb (fresh)	1·67
" " (concentrated 1 to 7)	10·65
Liq. Rhei. Conc. B.P.	10

It is evident that whatever their virtues the concentrated infusions and liquors do not exactly represent the fresh infusions for which they are substituted.

Tinctures.—With regard to tinctures, I have not found reason to modify the figures for percentage of extractive which I published some time since in conjunction with Mr. C. G. Moor, in my synopsis of the British Pharmacopœia, except in three cases.

Ammoniated Tincture of Ergot.—4 per cent. is too high a figure for the extractive.

Tincture of Pellitory.—I have obtained results nearer 0·5 per cent. than 1·5 per cent.

Tincture of Cascarilla.—Some abnormal results were obtained on this tincture, the extractive being as low as 1·285, but this was traced to the fact that a bark yielding a high percentage of ash had been inadvertently used. The standard for extractive should, however, be 2 per cent., not 3 per cent.

Compound Liquorice Powder.—The great diversity in appearance of commercial samples of this popular remedy seems to suggest that they do not all strictly conform to the standard of the Pharmacopœia. The demand of late has been for a powder light in colour, and a fashion prevails of grinding all the powders together. As this must be followed by sifting, it is difficult to see how the correct balance of the ingredients can be maintained, for the fennel and liquorice, and even the senna, naturally yield more "gruffs" than the sulphur or sugar. The following results were obtained on a sample, made from powders ground separately: Moisture, 4·15 per cent.; ash, 4·3 per cent.; soluble ash, 2·685 per cent. A tincture was prepared by macerating 5 Gm. of the powder in 70 c.c. of 70 per cent. alcohol. On examination this was found to yield 4·475 per cent. of extractive. Two commercial samples were examined with the following results. Sample A: Moisture, 6·35 per cent.; ash, 4·5 per cent.; soluble ash, 2·8 per cent.; percentage of extractive of a tincture made as above, 4·835 per cent. Sample B: Moisture, 5·4 per cent.; ash, 4·5 per cent.; soluble ash, 3·15 per cent.; percentage of extractive of tincture made as above, 3·73 per cent.

Further experiments are necessary to prove if these figures are of value as a gauge of quality.

Extract of Malt.—One is glad to note in the new edition of the B.P.C. Formulary that a standard of diastasic strength is given for this preparation. It is required that the extract shall convert twice its weight of Bermuda arrowroot in thirty minutes at a tem-

perature of 100° F., which is a somewhat low standard, as the following results obtained on commercial samples show. Most of the tests were made before the formulary was published, so that the results are not strictly comparative, being taken at different temperatures.

Sample.		Minutes.
A.	Digested 2½ times its weight of potato starch at 158° F. in	12½
B.	" " " " "	10
C.	" " " " "	6½
D.	" " " " "	6
E.	" " " " "	22½
F.	" " " " "	6
G.	" " " " "	4½
H.	" " " " "	13
I.	" " " " "	15
J.	Digested its own weight of potato starch at 100° F. in	4½
K.	" " " " "	4
L.	" " " " "	6½
	and its own weight of arrowroot at 104° F. in	6
M.	Digested its own weight of potato starch at 100° F. in	4½
N.	" " " " "	8

A sample of liquid extract digested twice its weight of potato starch at 100° F. in 10½ minutes.

I would gratefully acknowledge the assistance of Mr. C. G. Moor, M.A., Mr. Sydney C. Gadd, and Mr. Walter Sayer.

Mr. Maben said he understood that Mr. Martin would standardise the drugs themselves, and make the preparations from them. The question was, what was the reputation of drugs founded upon; was it upon good drugs or bad? Mr. Martin admitted that the reputation of a drug had in the past been based upon good drugs alone. Surely pharmacists could now say that they would provide preparations which were uniformly good, and not sometimes good and sometimes bad, as was at present the case; and if so, that was all that the advocates of standardisation claimed. With regard to jalap, for example, no doubt five years ago there was a 5 per cent. and an 18 per cent. jalap, just as now; but surely it was infinitely better to have a uniform preparation in accordance with the requirements of the B.P. If a preparation were standardised on its alkaloidal contents, it must not be assumed that the preparation contained nothing but the alkaloid. It contained all the other constituents as well as the characteristic alkaloid. As to the possibility of resorting to adulteration in order to increase the

alkaloidal contents of a preparation, that possibility had existed ever since standardising came in, and all along pharmacists had had to rely on the good faith of manufacturers. He thought it would be better to increase the number of standardised preparations rather than decrease it. To standardise the drugs was impracticable, and besides, if it were practicable, it would only shift the difficulty further back; it would not remove the difficulty.

Dr. GRIFFITHS thought important advantages were to be derived from the use of crude drugs. He had long used them in preference to the alkaloids. He considered nux vomica one of the finest tonics they possessed, but he preferred the old tincture, the present one being too strong. Five minims of the old tincture of nux vomica was ample for the average patient. He then instanced the case of one of his brother's patients, a big full-grown girl, who was given one 8 oz. bottle of medicine containing only one minim Liq. Strychninæ to the oz., and who was so susceptible to the alkaloid that she developed definite symptoms of strychnine poisoning with even this small dose, and said that he thought as medical men they would do better to be content with the pound of beef rather than the Liebig's Extract for the average patient. Of course there were cases where a strong drug was necessary. He was perfectly sure that he had saved the life of a child who was dying from pneumonia by giving it heroic doses of Liquor Strychninæ hypodermically. He was pleased to find that pharmacists were alive to the fact that they must supply the medical man with a good galenical preparation. The doctors were quite content to leave the matter in the hands of the pharmacist, and he was quite sure if there were a little more unity between the chemist and the medical man, and if they met together and talked matters over, they would understand how to help one another much better.

Mr. BIRD said he would just like to place on record the figures for extractives obtained from belladonna root, samples of which had been supplied to him by Messrs. Stafford, Allen, & Sons. The total extractives obtained by the menstruum used for liquid extract of belladonna were in the first year's root 32·4; second year's root 30·0; and the third year's root 28·2 per cent.

Dr. MCWALTER considered that these two papers were *the* papers of the Conference, and Mr. Martin deserved their best thanks for drawing attention to the work of E. Merck, dealing with the standardising of galenical preparations. Formerly, if you went into an ordinary pharmaceutical chemist's and got an ounce of tincture of opium, you were supplied with a preparation

which he had made himself—not, indeed, always the same, but still of a moderately definite strength, and on the results of which you might definitely and uniformly rely. Now, when you asked for tincture of opium you obtained a spirituous preparation, of which the only definite characteristic was that it contained ·75 per cent. of morphine. The late Professor Leech, of Manchester, seemed to be possessed with the idea that if one knew the active principle of any drug, anything else was more or less inert and useless, and that, therefore, it should be the aim of the pharmacologist to reduce all drugs to their active principle. Dr. Leech held that opium was nothing but morphine, and that nux vomica was nothing but strychnine, and it was on account of what he must be excused for calling this heresy that the whole field of therapeutics had been disturbed, and practitioners now sought in vain for the results which the ordinary preparations formerly yielded. It had been found that the preparations of belladonna leaves varied very much in alkaloidal strength; in some the atropine was very perceptible. They had now introduced into the Pharmacopœia a very active tincture of belladonna, but it was so active that many cases of poisoning had been caused by the use of it. The inevitable result of standardising drugs would be that the pharmacist and the smaller wholesale druggist would no longer make them. The manufacture of these things had fallen to houses the number of which you could count on your fingers. The number of houses which now made tincture of opium was not 10 per cent. of those who formerly made it. The commercial element must come in with all these things, and no man would go to the trouble of making tincture of opium and standardising it if he could be sure of obtaining it ready prepared at a much cheaper rate. There were few drugs which could be more relied upon for certainty of effect than digitalis, the process of making which had not varied for the last 100 years. All the research that had been expended on it had hitherto been in vain; it had not been improved a bit, and it was one of the things which physicians could rely upon. With regard to Mr. Gadd's paper, the figures given by it were of immense and incalculable value.

Dr. Attfield moved the adjournment of the discussion, but begged leave to say at once that in his opinion Dr. McWalter had not accurately represented the opinions of the late Dr. Leech.

At this point the discussion was adjourned until the following day. (See page 396.)

Wednesday, July 31st.

The PRESIDENT, having taken the chair at 10 a.m., introduced to the meeting a distinguished visitor, Professor A. B. Prescott, Dean of the School of Pharmacy in the State of Michigan at Ann Arbor, member of the Council, and last year's President of the American Pharmaceutical Association, and who had taken a prominent part in the compilation of the United States Pharmacopœia. He asked the Conference to extend to Professor Prescott a hearty welcome. He had only arrived in Dublin the day before, and could not join them in the earlier sessions of the meeting, but none the less heartily did they welcome him.

Professor PRESCOTT: Mr. President, members of the British Pharmaceutical Conference, and fellow-members of the fraternity of pharmacy, it gives me very great pleasure to be present with you, and I desire to thank your President for this very kind introduction. Pharmacy is something which should bring its practitioners and votaries all over the world very near together. It is a bond of unity by reason of the science which it represents and requires and uses, and it is a bond of unity by reason of its benefit to humanity and the part that it takes in the preservation of human life. I know that I am fully authorised to present the heartiest greetings of the American Pharmaceutical Association to this body as a sister national society, and in so doing I offer the greetings and congratulations of the entire body of pharmacists in the United States. We are coming, Mr. President and friends, every year nearer and nearer together as English-speaking people. Since I came to Great Britain a few weeks ago the thought has sometimes come into my mind, are we not in danger of losing that individuality upon which we have prided ourselves? I do not know but that we are to be swallowed up in those dominions beyond the seas in which we all take such great pride. But we are very glad that we are brought nearer and nearer together. I hope to be able to speak to many of you; to hear the voices of some of you during the day and during the remainder of the session. It is my regret that I was not present yesterday, but I thank you again, and return my very best thanks to your President for this very kind and favourable introduction.

The first paper was read by Dr. ATTFIELD in the absence of the author.

THE DETERMINATION OF PHENOL WHEN MIXED WITH RESINOUS SUBSTANCES.

BY JOHN C. THRESH, M.D., D.SC., ETC.

A little time ago I desired to determine the amount of phenol in a number of samples of carbolised gauze. This gauze is very largely used for surgical purposes, and the phenol is "fixed" to the gauze by aid of resin, in the process of manufacture.

A gauze, which was said to contain 5 per cent. of phenol when examined by the usual process, gave results which were not concordant, and varied from 1·5 to 2 per cent. The usual process, described in Allen's *Commercial Organic Analysis*, consists in dissolving out the phenol and other substances with ether, shaking the solution obtained with dilute alkali, liberating the phenol by acid and taking up with ether, etc. Upon mixing phenol with resin and trying this process I speedily found that it was useless for the purpose. After numerous experiments I devised the following simple process, which gave very concordant and accurate results:—

The gauze, about 20 Gm., was placed in a flask capable of holding about 700 c.c. of water, 500 c.c. of water acidulated with hydrochloric acid added, and a few fragments of granulated zinc. Heat is applied, and about 300 c.c. distilled over slowly. This practically contains the whole of the phenol, and it can be readily determined by the bromine process. The zinc enables the boiling to be carried on steadily, and the gas bubbles, with a little manipulation, keep the gauze from matting together.

When testing the method, I mixed various quantities of phenol with an alcoholic solution of resin, poured the mixture upon some clean gauze, dried rapidly by shaking for a minute in warm air, and then introduced it into the flask. The results obtained were as under:—

Calculated Percentage of Phenol in Gauze.	Amount of Phenol found.
6·0	5·88
6·0	5·64
4·0	3·75

There is undoubtedly a little loss of phenol in the drying of the gauze, and this I find is well known by the manufacturers, and an

excess of phenol is added in order to ensure the full percentage in the finished product.

The samples certified to contain 5 per cent. by the manufacturers gave the following results: (*a*) 4·70, (*b*) 4·91, (*c*) 4·96, (*d*) 4·86.

It was found that the gauze in the centre of each packet usually gave a little higher result than that from the outside, the loss being, no doubt, due to the evaporation. The following results were obtained from the various parcels:—

	Outside.	Inside.
1.	4·60	4·83
2.	4·70	4·93
3.	4·75	4·90
4.	5·03	4·90
5.	4·76	4·96
6.	4·40	5·40

The exception, No. 4, seems to indicate that the diffusion of the phenol through the gauze is not absolutely uniform, and this is probable from what I have seen of the process of manufacture, but the variation cannot be great.

By passing a current of steam through the gauze, enclosed in a glass tube, and condensing the vapour, fairly good results are obtained, but the process is neither so simple nor so satisfactory as the one described. The presence of resin does not affect the results, as the resin gives off no volatile matter combining with bromine. An aqueous infusion of resin, on the other hand, does decolorise a small quantity of bromine.

A vote of thanks was unanimously accorded to the author.

The discussion on the papers of Messrs. Martin and Gadd (see page 393) was then resumed by Dr. ATTFIELD, who said he occupied a favourable position for taking an unbiassed view of this question, the principles of which had chiefly been dealt with by Mr. Martin, and the practice by Mr. Gadd. For, not being either a medical man or a pharmacist, but in his official position having for nearly twenty years been intimately connected with both, he could state what was the position of many medical men in regard to standardisation. The late Dr. Leech and others equally eminent had often put the case before him in this way: A certain powerful drug had made for itself a reputation; its action might vary with different individuals, and even with the same individual at different times, the reason of that not then being known. The time came

when what was termed "the" active principle of the drug was discovered, but it was afterwards found to be only "an" active principle, although it might be the chief one. Its galenical preparations were still more or less untrustworthy because practitioners did not yet know enough of the drug; but having got at any rate the chief active principle, as a matter of expediency and for temporary purposes they fixed on that active principle and determined its amount in the respective preparations, and then by concentration or by dilution provided for constancy in the proportion of the principle, and so were a little better off than when they had trusted merely to the very variable elements of climate, seasons, soil, and so on. In other words, the element of uncertainty of action of the drug was reduced by the expedient of standardisation. Time went on, and the whole of the active principles were discovered, say three. Then certain advanced physicians desired to have those at their disposal in order that they might administer whichever they pleased, and so might know that its action was not interfered with by the others, or, if they pleased, they could give two or even all three. They then knew what they were doing, which they did not know before. When they had arrived at that position why should they go on giving all the mish-mash of other than active principles which was found in decoctions, tinctures, and extracts? The drug itself then ceased to be administered, the galenical preparations disappeared, the separate active principles being at the disposal of the physician. Now, if there were many drugs in the position of the one he had pictured, it was evident that galenical pharmacy must sooner or later come to an end. That this was being recognised in this country was evident, and it was equally recognised in the United States and on the Continent, as was abundantly indicated at the Brussels Pharmaceutical Congress of 1897 by the speeches of Messrs. Colin, Petit, and others, and by the resolutions which were passed. That was enough to show what underlay the practice of standardisation. It was only a temporary expedient, and when they got more certainty as to the source of action of all drugs, standardisation would naturally cease. For as soon as they knew and could isolate commercially every active principle—oily, resinoid, alkaloidal, glucosidic, acid, or other definite principle—of a natural drug, the displacement of its galenical preparations by the separated principles was only a matter of time. Chemical pharmacy was advancing, galenical pharmacy slowly passing away.

Mr. Kelly said, with regard to the standardisation of drugs, it must be admitted there was something more in drugs besides the

active principle. Referring to tincture of opium, the B.P. told them, after determining the alkaloid, to make up to a certain quantity with 90 per cent. spirit and water equal parts. If that rule were followed with tincture of opium why should it not be followed with tincture of jalap? A cup of tea without sugar or milk was to a lady exactly what an alkaloid was without the other substances.

Mr. NAYLOR said any description of the physical constants should have attached the conditions under which they were taken.

Mr. UMNEY said the principle of standardisation ought to be looked at from two aspects, first, the medical aspect, so as to be sure that the combination of alkaloids with natural vegetable acids was identical in effect with the combination with sulphuric acid and similar acids. Having made sure that the combinations were identical in action, then they were at liberty to standardize preparations to a definite alkaloidal strength. Then the second aspect, the conditions of soil and the time of collection, which affected the extractive and the consequent relation of that to the alkaloid, had to be taken into account. It was difficult to make preparations on a large scale, which would tally with those made on a small scale, and to make preparations which would under all conditions be the same. It was impossible to get belladonna roots obtained from different places and at all times of the year identical in relation to extractive. He had had samples of belladonna root, English grown, that would yield as much as 28 to 30 per cent. of extractive. Until they were able to fix a bottom limit and a top limit for alkaloidal strength, and a stated time for the collection of drugs, he did not see how they could arrive at proper chemical and physical standards.

Professor PRESCOTT said standardisation was a very interesting and enticing subject, and one that had occupied much time at pharmaceutical meetings in the United States. It was certainly true that all the experimentation in physiological pharmacology—the determination of the effects of drugs and medicines—had been quite largely (not wholly) confined to the determination of the effects of chemical individuals—distinct chemical compounds. The results from these had been of great value, in the first place, regarding the leading effects of vegetable drugs; they were only approximately certain, and they must never forget, as had been brought out in that discussion, that in any vegetable drug there were a great number of chemical individuals which modified the effect of the whole. As the harmony of a piece of music was not

dependent upon a single tone, as any desirable colour which pleased the eye was not dependent upon the primary element of colour, so it was that the best effects of medicines were not obtained by single constituents, but by the harmony of the constituents acting with each other as provided by nature itself. He hoped that more and more experimental pharmacology would be used in defining the physiological effects of these drugs upon animals and man, so that there might be a limitation in the possibilities of standardisation as they understood it. It still remained true that the definition of any drug was dependent largely upon chemistry as to what it contained. It required chemistry to define the constituents of a drug, and what was called standardisation was to give this definition in chemical terms—a definition as to what nature has done first, and what primary chemical individuals were brought together into the bolus of the vegetable drug as it stood. Let them hope that no efforts would be relaxed in chemical investigation and standardisation. There was no danger that too much would be done in this direction; but there might be danger in this—that too much dependence would be placed upon incomplete results.

Mr. Rutherford Hill said the subject was of great importance, and was introduced at an opportune moment. While there might be no difference of opinion as to the desirability of standardising galenical preparations, there might be as to whether the method followed was the best to obtain the object in view. Sodium bicarbonate and tartaric acid would keep intact when mixed and perfectly dry, but the slightest moisture induced decomposition. In the same way a fluid extract of a drug invited decomposition which was progressive, as in the case of fluid extract of ipecacuanha. He thought Dr. Attfield had given play to his imagination, and was treating of a period in the far distant future. They had to deal with the existing condition of things, and it would be agreed that the effect of standardisation had been greatly to improve the quality of drugs generally. He did not agree with Dr. McWalter when he said there had been no advance in the preparations of digitalis in the last hundred years. In Edinburgh, at least, it was a frequent occurrence to find recent infusion of digitalis prescribed by practitioners because it was found that infusion which had been kept lost its efficiency. He agreed with Dr. McWalter that the present method of standardisation tended to throw the manufacture of galenical preparations into the hands of a few large makers, which was a great disadvantage to practical pharmacy, and reduced the individual pharmacist to little more than an unintelligent dis-

tributing machine. It also lent itself to more or less faking on the part of the manufacturer, and invited the making of standardised liquid preparations in large bulk, the consequence of which was that the retail pharmacist was unable to say that he was supplying fresh drugs; they might be standardised, but they were not fresh. Mr. Martin had suggested that they should fix a definite standard for the drug itself rather than the preparations of the drug. That offered the advantage of enabling the retail pharmacist to make his own galenical preparations. They were training pharmacists, but he did not see the object of doing so if the whole of practical pharmacy was to be put in the hands of the wholesale producer. He advocated a top and bottom limit of active principle in the crude drug which would compel greater attention to the proper conditions of climate, soil, season and harvesting to obtain the highest results.

Mr. Martin, in reply, said the remarks which had been made had added to the value of the suggestions contained in his paper. He was indebted to Dr. Attfield for the lucid exposition he had given of the relations of medicine and pharmacy to the method of standardisation. He knew from daily contact with thousands of prescriptions, and from conversations with medical men, that they got effects from the old-fashioned tinctures of nux vomica and cinchona which they could not get from strychnine, etc., and therefore they must continue to make galenical preparations. The gist of his paper was that they should make true galenical preparations. Mr. Hill had referred to the effect of standardising crude drugs, but he did not use that term; he suggested they should have assay processes which would insure that the drug did not fall below a certain standard, that the description should be more careful and accurate. He was glad to find that Mr. Bird had been experimenting on belladonna, and hoped he would continue, and his results be accompanied by determinations of the amount of alkaloid. That would give information of great value, and would secure their getting plants of the highest value, from which to make their preparations, which would not then vary within important limits. In the paper he had referred to, Merck said that if a man made a batch of extract of henbane, which was below the standard of the German Pharmacopœia, the proper thing to do would be to throw it away and make another, but he could easily add a certain proportion of extract of belladonna to it and bring it up to the standard. Yet the henbane would have really lost all its distinctive characters. Such a thing ought not to be possible.

He was glad to hear Mr. Hill's remark in reference to the pharmacist making his own preparations. With regard to nux vomica he was struck with the fact that one could not make 16 oz. liquid extract of nux vomica from the quantity prescribed; but must use 20 or 24 oz. Then what other principles were there added to the extract? How did the tincture of nux vomica, standardised to strychnine, secure the uniformity which was intended and which would be obtained by assaying the nux vomica beans and making the tincture by percolation. In making tinctures direct from the assayed drugs the solvent was so largely in excess of the soluble matter that if made carefully the preparations would always be uniform. Prof. Prescott had exactly hit the mark in his references to music and colour. Most drug preparations were far more complex than could be described in the terms of one factor only. He knew that many medical men attached greater value to those other factors in many cases than to the alkaloid, but if there were those who preferred to use the pure alkaloids the pharmacist could not object. Let science advance by all means, even if the pharmacist had to retire to the workhouse. He concluded by referring to the practice of mixing Carthagena ipecacuanha with Rio ipecacuanha, which he would never think of doing, though it saved expense, and by thanking the gentlemen who had taken part in the discussion.

Mr. Gadd also thanked the Conference on his son's behalf, for the manner in which his paper had been received, and expressed the hope that some day all drugs would be examined at the port of arrival, and sold on the basis of their assay.

The President proposed a hearty vote of thanks to the authors of these papers, which had evoked a most interesting and valuable discussion.

The next papers were read by Mr. Thos. Tyrer.

LABORATORY NOTES.

By T. Tyrer, F.I.C., F.C.S., and C. T. Tyrer, F.C.S.

I.—Distillation and Boiling Points.

As the result of a difference of opinion as to the distilling points of a sample of petroleum ether the following experiment was made to ascertain what differences the position of thermometer made.

Half-litre flask was made with five openings for thermometers

so arranged that No. 1 was $\frac{1}{2}$ in. above the liquid, No. 2 $1\frac{1}{2}$ in. above the liquid, No. 3 in the neck of flask, No. 4 in neck of flask just opposite the exit, No. 5 about 1 in. in exit tube. The thermometers were carefully compared and checked. Two observers took the readings as nearly simultaneously as possible. The rate of distillation was as nearly as possible twenty-five drops per minute; when, however, $\frac{1}{10}$ was left the drops were eight per minute, when $\frac{1}{20}$ was left very little came over, although the liquid was boiling violently. 250 Cm. were taken. The sample should have boiled *all under or at* 60° C. The flask was placed on a water-bath, fitted with a gas regulator.

The following are the readings :—

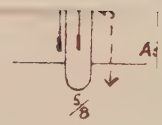
1	2	3	4	5	Temp. of Bath.
35	34	32	33	33·5	57
37·1	36	35	34·5	35·5	—
38·5	36·2	36	35·8	36·2	—
40	38	38	37·8	37·5	—
41	40	40	39	39·8	—
42·5	41	41	40	40·7	—
43·1	42·5	42	42	41·5	—
44·5	43·4	43	42	41·7	—
46	45	44·8	43	43	58·8
48	47	45	43·2	43	—
48·5	48	46	44	43	—
51·5	51	46	44·5	43·2	60·4
55	54	46·1	43·2	41	—
55	56	46	42	39·2	62·4
57	60	46	40	30·5	65·9
59	60	51	43	30·8	68·2
60	60·8	53	43	31	69
61	62	57	51	34	—

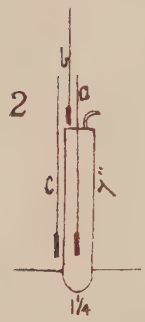
From the above it will be noted that the position of the thermometer has a marked influence on the result of observations.

In the case of liquids fractionating at higher temperatures than the above, the difference is more marked.

In the case of terebene fractionations the differences in readings of points marked 1 and 2, were as follows :—

1	2
155	157·5
155·5	158·4
157	159·8
157·5	160·3





We

With another apparatus the differences in readings between points marked 1 and 2, were :—

1		2
160	. . .	161·1
162	. . .	163·2
162·5	. . .	163·9
163	. . .	164·8

The readings were also affected by exposure of the neck of flask to air currents. An apparatus, in which the thermometer is sealed in the neck, and which is protected by an air jacket. gave appreciable differences against a similar flask unprotected. The following differences were observed, the experiments being carried on as nearly as possible in the same line.

Protected.		Unprotected.
157	. . .	156·8
157·5	. . .	157·3
158	. . .	157·4
158·5	. . .	158·4

Whilst the readings of the protected apparatus were steady, those of the unprotected apparatus were fluctuating.

Our observations lead us to the conclusion that in taking fractionations with a flask and not using a column, a bath should be used where possible, the temperature of which should be about 10° C., and not more than 15° C. above the highest distillation point of the liquid under examination. Where a bath is not used, the upper part of the flask should be protected from hot air currents by an asbestos disc, the burner being carefully regulated, and the liquid not boiling violently. Where possible an apparatus should be used in which the thermometer is entirely emerged in the vapours. The bulb of the thermometer should be just in the neck of the exit tube, and not opposite it, as this latter is the point at which the vapour comes over.

Where a fractionating column is used, we have found good results from an apparatus devised by Mr. Wertheimer and one of us, shown in the table. The constrictions in the lower tubes have the effect of producing a slight cooling by expansion when the vapour is released. The reading is taken just in the exit tube.

The foregoing experiments caused us to ascertain if variations in construction of apparatus influenced the determination of boiling points. All the various kinds of apparatus gave high and variable results unless the upper portions of the tubes or flasks were pro-

tected from hot air currents from the burner by an asbestos disc 12 inches in diameter, with a hole in the centre, so that only the base of the tube or flask was exposed to the direct heat of the flame. The following experiments were performed with the apparatus shown, and all protected with an asbestos disc, on pure air free distilled water. In each case the thermometer was placed 1 inch above the surface of the liquid, which was kept boiling steadily. Seven thermometric readings were taken of each experiment at intervals of thirty seconds, the outside thermometers being placed ¼ inch away from the sides, and all the above experiments being made without condensers attached. The results show comparatively small differences between the different methods, the lowest reading being 99·8 for the 7 × 1¼″ boiling tube, whilst the jacketed vapour tube gave the highest results. We are inclined to favour the use of a tube long enough to include the whole of the thermometer as in experiment No. 3, with asbestos disc protector. It has the additional advantage of being easily and cheaply made.

It has been stated that the use of various condensers would variously affect the boiling point determination. To test this we experimented with the five condensers shown. The condensed water flowed at the rate of one pint in two minutes. The tube No. 3 was used.

The following table gives our results:—

1	2	3	4	5
100·1	100·0	99·9	99·9	100·1
100·2	100·0	99·9	99·9	100·2
100·1	100·0	99·9	100·0	100·0
100·1	99·9	100·0	99·9	100·0
100·2	99·9	99·9	100·1	100·1
100·1	100·0	99·9	100·0	100·1

The greatest difference is 0·2° C., due possibly to slight partial vacuum formed by condensation. We conclude that the effect of condensers upon the boiling point is almost a negligible quantity, and certainly would not affect pharmaceutical determinations, and in no way resembles the great differences obtained by using different melting point methods.

We recommend that in any future edition of the Pharmacopœia definite instructions should be given as to apparatus to be used, and conditions for fractionation and boiling point determinations.

II.—Comparison of the Quantitative Action of Reducing Agents in Mercury and Bismuth Salts.

In the *Pharmaceutical Journal* of December 1st, 1900, we stated that a modification of the hypophosphorous acid method (see Bennet, *Pharm. Journ.*, November 24th, 1900), for the determinations of mercury in salts had been in use by us for several years. Our procedure is as follows: 3–5 Gm. of the substance is dissolved in nitro-hydrochloric acid, the solution filtered if necessary, and caustic soda solution is added until a permanent precipitate is just formed. On the addition of hypophosphorous acid a white precipitate is formed. This slowly turns black, which change is accelerated by boiling and cooling, until there remains a black precipitate with clear supernatant liquor. The precipitate is placed upon a tared dense double Swedish paper, washed with water, drenched with alcohol, then ether, and dried in an air bath maintained at 98° C. by means of a thermostat. It is advisable to heat the beakers on a plate to prevent bumping. The beakers should be of such a size that loss by spurting during the evolution of gas is avoided. This method has been used for all kinds of mercurials, also complex residues giving us satisfactory results. We compared the above with other reduction methods with the following results:—

Stannous chloride.—This reagent rapidly and completely reduces salts of mercury from acid solutions. The mercury, however, remained in such a fine state of division that even using double filter papers of the finest texture, it was impossible to prevent loss of mercury. In every case we obtained low results.

Formaldehyde.—In acid solutions, hot or cold, only partial reduction to calomel occurs, the reaction not being sufficiently complete for quantitative results. With an excess of alkali the reduction is slow, even in boiling, whilst the fine state of division of the mercury causes low results, the same difficulty occurring as with stannous chloride.

In the above two experiments we tried various methods for causing the particles of mercury to agglomerate, such as boiling for a considerable time with water, with dilute acids, treating with alcohol and ether, and amalgamation with a known weight of zinc powder, granulated and foil; but were unsuccessful.

Phenylhydrazine hydrochloride.—No reduction took place in acid solution. Incomplete reduction to calomel occurs in presence of alkali. Both concentrated and weak solutions, strong and weak

acid; and just precipitation and with excess of alkali were tried with no success.

Arsenite of soda.—Reduction in acid solution is slow and incomplete; but complete reduction occurs in presence of alkali. The reduced metal is almost as coherent as that from the hypophosphorous acid method, but the results were somewhat lower.

Potassio-tartrate of antimony (tartar emetic).—With a strongly alkaline solution of tartar emetic reduction takes place, but the product is contaminated with sub-oxide of mercury and traces of an antimony salt, and was not available for quantitative estimation.

The treatment of samples for estimation by the methods used was as follows: White precipitate, corrosive sublimate, and oxide were dissolved in hydrochloric acid with the aid of heat, the solution diluted with twice its volume of distilled water, and pure sodium hydrate solution added until the mercury was just precipitated as oxide, the reaction really taking place on the oxide.

The following are some average results obtained:—

—	Ac. Hypophos.	Stannous Chlor.	Formal-dehyde.	Arsenite of Soda.
Hyd. ammon. chlor. . . .	76·9	75·81	76·32	76·53
Hyd. perchlor.	73·61	72·86	73·42	72·92
Hyd. ox. rub.	91·7	91·17	91·37	91·45

Phosphorous acid.—Solutions of mercury perchloride, solutions of mercury oxide, or white precipitate in hydrochloric acid are reduced to calomel on treatment with phosphorous acid on gently warming and standing from six to twelve hours. If the solutions be boiled for some time further incomplete reduction to mercury occurs. A considerable excess of phosphorous acid is required. Experiments on samples as above gave percentage of mercury calculated from calomel:—

Hyd. ammon. chlor.	76·64
Hyd. perchlor.	73·53
Hyd. ox. rub.	91·36

A modification of the method by Vanino and Treubert in *Ber.* [2], 129–130 (abs. *Journ. Soc. Chem. Ind.* [4], xvii. 399), gives fair results. To the dilute hydrochloric acid solution of the mercuric salt, excess of a mixture of hydrogen peroxide and hypo-

phosphorous acid (1 drop hypophosphorous acid to 1 c.c. of hydrogen peroxide) is added. On standing for one hour the mercury is precipitated as calomel, and is washed with water, then with ether, and dried in a water-bath, weighed and checked by treating with hypophosphorous acid to reduce to metallic mercury. An experiment on the same sample of mercury perchloride as above gave: Calculated from calomel, 73·52 per cent. of mercury; calculated from calomel reduced to mercury, 73·49 per cent. of mercury.

Reduction of bismuth salts.—We have made experiments, using hypophosphorous acid and also formaldehyde, and compared same with the sulphide method.

Hypophosphorous acid.—We find the best method of procedure is to dissolve the salt in as small a quantity of hydrochloric acid as possible, filter if necessary through glass wool, washing the wool with warm hydrochloric acid, then add sodium hydrate solution to neutralisation, add a slight excess of hypophosphorous acid, or a considerable excess of formaldehyde, and boil until reduction is complete. Wash by decantation with distilled water, place on a tared filter and wash rapidly with alcohol and finally with ether. The filter paper containing the reduced metal should be compressed and tightly folded to prevent undue access of air, as the metal is in such a fine state of division that it easily oxidises. This possibly accounts for the high results obtained :—

—	Hypophosphorous Acid.	Formaldehyde.	B.P. Sulphide Method.
Bismuth subnitrate . .	71·65	72·2	71·52
Bismuth subcarbonate .	81·26	81·31	80·93
Bismuth salicylate . . .	60·19	60·34	59·76

The hypophosphorous acid is preferable to the formaldehyde method, as besides the objection of pungent and irritating odour considerable bumping occurs in the latter method, increasing the risk of loss. We do not consider either of these methods has any advantage over the Pharmacopœia method.

III.—Effect of Glassware Containers on Acids.

Statements have been made at various times that acids have become impure through their action on the glass containers. We made the following experiments to test the accuracy of the statement. The samples taken were :—

Pure Acid	Sulphuric	s.g.	1843
„	Hydrochloric	s.g.	1160
„	Nitric	s.g.	1420
„	Hydrobromic	s.g.	1077

These acids gave originally an inappreciable residue. Four W. Qts. of green, white, amber, and blue glass, as usually sold, of each acid were filled and allowed to stand for seven months in diffused light on a laboratory shelf.

None of these acids showed appreciable or increased residue, or traces of iron, lead, or manganese, nor was there any coloration.

The sulphuric, nitric, and hydrobromic were free from arsenic. The hydrochloric acid showed a trace of approximately 1 in 2,000,000.

From the above it does not appear that those acids suffered appreciable deterioration by keeping in ordinary glass vessels.

Hydrochloric and sulphuric acids acquired a faint trace of arsenic after some days heating with finely powdered glass of each kind.

In connection with the testing of sulphuric acid for arsenic by the Marsh-Berzelius test, it is worth noting that a very faint trace of arsenic may not be indicated; but on the addition of pure arsenic-free hydrochloric acid a trace may become apparent, proving that the delicacy of the test is enhanced in the presence of hydrochloric acid.

In this and the preceding note, we desire to acknowledge services of our assistant, Mr. F. Gosling. The work has been carried out in the laboratories of Messrs. Thomas Tyrer and Co., Limited, Stirling Works, Stratford.

The President, in the absence of any discussion, proposed a hearty vote of thanks to Messrs. Tyrer, which was carried unanimously.

The following paper was then read :—

HYDRASTIN.

By Thomas Maben, F.C.S.

The latest edition of the B.P.C. Formulary will doubtless receive as warm a welcome as did its predecessors, and the new Chairman and his Committee are to be congratulated on its appearance.

Among other drugs now for the first time semi-officially recognised, is Hydrastin, and as comparatively little has been published regarding that preparation, a few notes may be interesting to the members of the Conference. It will be within the recollection of most of the members that hydrastis was one of the drugs introduced into the last edition of the Pharmacopœia, the editor having in that matter, as in many others, followed the lead of the Formulary Committee. It is quite probable that a similar course will in due time be followed in regard to some of the preparations now for the first time published in the Formulary, and it is, therefore, all the more necessary that the processes recommended for these should be carefully scrutinised. Hitherto no authoritative process had been published for the preparation of hydrastin, and it has, as a rule, been imported from America along with other so-called eclectic remedies. There has all along been considerable doubt as to its actual composition, although most authorities incline to the belief that it consists mainly of impure hydrochloride of berberine, and recent examination of a number of trade specimens is conclusive proof that the drug varies very much in quality.

Hydrastin is obtained from the rhizome of *Hydrastis canadensis*, and is essentially a mixture of the alkaloids occurring in that plant. The alkaloid first isolated from hydrastis was one of deep yellow colour, and Rafinesque in 1828 applied to this the designation hydrastine. In 1830, Buchner and Herberge gave the name berberine to the yellow substance isolated from *Berberis vulgaris*. As the yellow body in hydrastis was later found to be identical with the berberine of Buchner and Herberge, and furthermore, as the white alkaloid of hydrastis was found to be of greater therapeutic value, and peculiar to hydrastis, whereas the yellow one was not, common usage generally adopted the term hydrastine for the white alkaloid, and transferred the name berberine to the yellow alkaloid. It is to be hoped that this verdict of scientific men will soon be universally accepted by physicians and pharmacists, and thus obviate the troublesome mistakes that sometimes occur when these alkaloids are prescribed.

Hydrastine, when pure, is in colourless crystals, but owing to numerous fractures they are usually white and opaque. It is readily soluble in alcohol and in chloroform, also in ether, but only sparingly in water. Sayre directs it to be made by percolating with water, precipitating the berberine by hydrochloric acid, and adding ammonia to the filtrate from which the impure hydrastine

is then deposited. This method presupposes the hydrastine to be in combination with vegetable acids, and thus soluble in water, but it is of no value whatever, as the yield would be only a fraction of the total alkaloid.

Berberine, which is widely distributed in nature, being found in three natural orders at least, occurs in orange yellow acicular crystals. It is soluble in about 300 parts cold water, more so in hot; soluble in alcohol, insoluble in ether, and practically so in chloroform though the latter removes traces from acid solutions. The neutral sulphate is very soluble in water.

Both the alkaloids are bitter, but their therapeutic properties are quite distinct. Hydrastine is much the more powerful of the two, the dose being from $\frac{1}{4}$ to $\frac{1}{2}$ grain, whereas berberine is given in doses from 1 to 4 grains.

The two alkaloids occur in the rhizome, on the average, in the proportion of about 2 per cent. of hydrastine and about $3\frac{1}{3}$ per cent. of berberine, but the results of the assays of thousands of pounds of hydrastis proves that the percentage of both alkaloids varies very greatly. Whereas a very considerable proportion of the drug will contain less than 2 per cent. of hydrastine and less than 3 per cent. of berberine, it is nevertheless true that a first-class quality should average at least the proportions named. The following figures are quoted from the laboratory records of some assays of the drug; the first series were assayed both for hydrastine and berberine, and the second only for hydrastine.

Hydrastine.	Berberine.	Hydrastine.	Berberine.
1·18	3·0	2·5	3·13
1·9	3·0	2·8	4·15
1·7	2·7	2·32	3·24
1·7	3·0	2·7	3·48
1·6	2·55	2·0	3·3
1·6	3·5	2·1	3·1
2·0	3·9	2·6	3·0
1·8	3·6	2·0	3·0
2·05	3·3	2·33	2·22
2·8	4·06	mean 2·09	3·38

For hydrastine alone:—2·43, 2·43, 2·3, 2·4, 2·57, 2·75, 3·0, 2·75, 2·52, 1·89, 2·53, 1·66, 2·52, 1·69, 1·6, 2·51, 2·4, 1·18, 2·35, mean 2·28.

The average percentage of the entire series, therefore, works out at 2·18 for hydrastine, and, based on this, 2 per cent. has been

adopted in America, unofficially, as the standard for hydrastis, the amount of berberine not being taken into consideration at all. It is interesting to observe that the very same standard has been adopted in the new German Pharmacopœia—namely, a minimum potency of 2 per cent. of hydrastine for the Extractum Hydrastis Fluidum. Merck's recent criticism that this figure is "somewhat excessive" is unwarranted when we consider that it is really under, rather than over, the average.

It may be convenient if at this stage I give the processes that experience has proved to be the most satisfactory in the assay of hydrastis:—

Exhaust 10 Gm. of the fine ground drug by extraction with hot alcohol, either in a Soxhlet tube or in a flask with an upright condenser. Cool the percolate and adjust to 100 c.c. by the addition of alcohol.

Berberine (Yellow Alkaloid).

Put 25 c.c. of the above percolate in a wide-mouth flask of about 8-ounce capacity; add 1½ c.c. of hydrochloric acid (32 per cent.), ¼ c.c. of concentrated sulphuric acid, and 125 c.c. of sulphuric ether. Cool; shake well and allow the mixture to stand twenty-four hours in a refrigerator, and the crystals of berberine hydrochloride will separate. Filter through a tared paper and preserve the filtrate. Wash the crystals with a mixture of equal volumes of alcohol and ether until the washings cease to give an acid reaction. Add the washings to the filtrate preserved as above directed. Dry the crystals at 105° C., and weigh. The result multiplied by 0·9017 gives the berberine. This multiplied by 4 is equivalent to the berberine in 10 Gm. of the drug.

Hydrastine (White Alkaloid).

Render the combined filtrate and washings from berberine above very nearly neutral or only faintly acid. Evaporate nearly to dryness on steam bath; treat the residue with hot water in small quantities, filtering same into a stoppered separating funnel until the washings from the residue cease to give an alkaloidal reaction with the ordinary test reagents. (The extraction of the alkaloid from the resinous mass left after the evaporation of the combined filtrate and washings may be somewhat expedited at this point by the addition of a few drops of alcohol at each extraction with water, evaporating off the alcohol each time before the aqueous

washing is poured off.) Add to the aqueous extract in the separating funnel *q.s.* ammonia water to render alkaline and extract hydrastine alkaloid by agitation with ether. Continue the extraction with ether until the hydrastine is entirely removed; evaporate off the excess of ether, and re-extract the hydrastine by means of several portions of 5 per cent. sulphuric acid, and from the combined acid washings extract the hydrastine again by shaking with several portions of ether, after having rendered the solution alkaline with ammonia. Finally, evaporate off the ether, dissolve the hydrastine in an excess of N/20 acid, titrating back the excess with N/100 alkali in the usual manner, using cochineal as an indicator. The result multiplied by the factor 0·00383, and this by 4, gives the hydrastine in 10 Gm. of the drug.

In determining hydrastine alone, the drug can be extracted and the berberine precipitate, as above indicated, discarded, the hydrastine being determined by the remaining part of the process.

Where the concentration or extract is assayed instead of the drug, the same process can be used, it only being necessary to substitute extract or concentration equivalent in hydrastine content to drug.

If a shorter method for the determination of hydrastine alone is desired, the following may prove serviceable:—

Weigh out ½ Gm. of the concentration, place in a beaker, add *q.s.* 60 per cent. alcohol to make a solution by warming, or to dissolve the greater portion of it. Distribute this alcoholic solution upon about 2 oz. of well-washed sawdust or other inert material, rinsing out the beaker with successive small portions of 60 per cent. alcohol, which are also transferred to the absorbent material. Place the dish containing the absorbent material in a warm place and allow to stand until the alcohol is practically all evaporated so as to leave a dry powder. (The idea here is to distribute the extract of hydrastis over a large bulk of material and thus present a large surface for extraction. Having succeeded in this, we wish to get rid of the alcohol.) Transfer the absorbent material to an 8-oz. flash, add 150 c.c. of sulphuric ether and *q.s.* water to moisten the mass, also *q.s.* ammonia water to render alkaline. Cork tightly and shake at intervals during five hours. Allow to settle, decant 75 c.c. of the clear ethereal solution, equivalent to ¼ Gm. of the concentration. Transfer same to a stoppered separating funnel and extract the hydrastine by shaking with several portions of 2 per cent. hydrochloric acid. Collect the acid washings in a second separating funnel, render alkaline by the addition of ammonia

water, and extract by agitation with several portions of sulphuric ether until all the hydrastine is removed. Evaporate the ether, dissolve the hydrastine remaining in a sufficient quantity of N/20 acid, titrate back with N/100 alkali, and proceed as in the latter part of the process above given for the assay of the drug.

With regard to the actual composition of the hydrastine of commerce the various authorities confess themselves at sea. Martindale says, "It consists principally of berberine hydrochloride with extractive"; Squire, that "it is said to consist principally of berberine hydrochloride with some hydrastine"; and Sayre that "it is probably, in the main, an impure muriate of berberine." The last authority states that it "is made by precipitating a concentrated alcoholic tincture of hydrastis with acidulated water, and collecting the precipitate." No doubt hydrastin made by this process might be, in the main, an impure muriate of berberine, and possibly also Martindale and Squire have had some such preparation in their mind when they described the drug, but it is quite obvious that such a preparation does not represent the entire active principles of hydrastis in a concentrated form, which we have always been led to understand is the claim made for hydrastin. In order to have an accurate comprehension of the arguments in such a case as this, it is necessary to know something of the history of the preparation. Inasmuch, therefore, as hydrastis was first used to any considerable extent by the Eclectic School of Physicians in North America, and as they also introduced the concentrated form of hydrastis which has since become generally known as hydrastin, we may logically turn for information as to its constitution to American manufacturers of the preparation. From this source we learn that the concentrations, as a class, occupy in a measure an intermediate position between the solid or powdered extract and the pure isolated active constituents of drugs. Thus, in the case of hydrastis, the American extract, solid or powdered, would represent, say, five times its weight of drug, whereas the concentration would represent still greater proportion of drug—in the case of some pharmaceutical manufacturers as much as ten parts, making it thus twice as powerful, medicinally, as the (5 in 1) extract. Unfortunately there does not seem to be any uniformity in the degree of concentration in this class of preparations, and hence there is a wide discrepancy in the therapeutic value and cost of manufacture of different commercial specimens. As the medicinal efficacy of hydrastis preparations depends primarily upon the alkaloid hydrastine, and

as, furthermore, this is the most costly constituent commercially in hydrastin concentration—the berberine being in a measure a by-product from the manufacture of hydrastine salts—it would be perfectly logical to value the compound solely by the percentage of hydrastine alkaloid contained; moreover, this seems to be the custom among the leading American manufacturers.

The lack of a process for the preparation of hydrastin has now been supplied by the B.P.C. Formulary, but it is to be regretted that the product so obtained does not represent the hydrastin that pharmacists have been accustomed to dispense and physicians to prescribe—certainly not the better grades of the imported article. The process is as follows: "Hydrastis rhizome, No. 60 powder, 1 lb.; alcohol (60 per cent.), a sufficient quantity. Moisten the rhizome with 8 fluid ozs. of the alcohol, pack in a percolator, gradually pour on more of the alcohol till the hydrastis is exhausted, collect the liquid and remove the alcohol by distillation; evaporate the residue to dryness and reduce to a fine powder. Transfer immediately to a well-closed bottle. Dose, ½ to 2 grains."

I have not had an opportunity of trying this process, and therefore my remarks upon it are, to a certain extent, theoretical; but they are, nevertheless, based on experience with the use of different menstrua in extracting the drug. With this process and menstruum, therefore, I surmise that about 20 per cent., or less, of residue of a pilular consistence will be obtained. Supposing that 20 lbs. of extract are obtained from every 100 lbs. of drug percolated, and assuming 2 per cent. of hydrastine as the content of the drug, the product would contain 10 per cent. of hydrastine, and would, consequently, represent five parts of drug, provided the drug were thoroughly exhausted. Inasmuch as there is always some loss of alkaloid through imperfect extraction and through manipulation, and as, moreover, the pharmacist is more than apt to purchase a drug containing less than 2 per cent. of hydrastine to start with, his finished concentration would probably fall considerably short of 10 per cent. white alkaloid. Assuming, however, that hydrastin made by the Formulary process contains the full 10 per cent. of hydrastine, it would only represent five parts of the drug, and would consequently be of the same strength as certain solid and powdered extracts of hydrastis on the market. It appears to me that if the word "concentration" means anything, it ought to suggest something more active than the ordinary extract, and as this latter class of products has by general consent been produced in such a way as to represent from three to five parts of the

drug, a preparation of hydrastis representing only five parts of the drug cannot logically be regarded as a concentration.

This argument is based on the assumption that the hydrastis is thoroughly exhausted in the B.P.C. process, and that the dried extract contains the maximum percentage possible of white alkaloid. But this is an unduly favourable view, for I must point out that the process proposed is not sufficient to exhaust the hydrastis, and consequently the probabilities are that the preparation will contain much less white alkaloid than 10 per cent. Further, not only will the extractive be deficient in alkaloid, but, owing to the weak alcoholic menstruum, it will be hygroscopic, and, unless care be taken to guard against atmospheric influences, the powdered extract will by-and-by relapse into a sticky, semi-solid, gum-resinous mass.

In order to ascertain exactly how the case stands, I have examined six samples of commercial hydrastin as to their alkaloidal content. Of these four are American, one is B.P.C. manufactured by a reliable firm, and one is from an unknown source. One is given out as containing 20 per cent. of hydrastin, one as containing the combined alkaloids of golden seal in the same proportion as they exist in the drug, but in ten times the concentration, and no claim is made for any of the others. In appearance three of the samples are of a bright yellow colour, in fine powder, and perfectly non-hygroscopic. One is darker in colour but non-hygroscopic, and two, including the B.P.C. sample, are in coarser powder, hygroscopic in character, and also darker in colour.

Estimating the alkaloids by the processes already given, the following percentage results were obtained:—

Nos.	1	2	3	4	5	6 (B.P.C.)
Hydrastine,	15·2	8·7	trace	trace	trace	trace
Berberine,	23·56	9·67	26·9	16·53	trace	trace

I am disposed to regard these figures as low in every case, first because there being so little alkaloid to work upon, there is the risk of error owing to loss in the repeated extraction and re-extraction of the hydrastine, and secondly, owing to the long washing to get rid of the acid on the filter, a certain quantity of berberine is dissolved out by the alcohol, a better mixture probably being one of alcohol to two of ether. This remark applies to all the samples, but as a comparative test, the figures answer the purpose of this paper.

From these figures it is clear that there is a marked difference between the various preparations sold as hydrastin, and it was high

time that the B.P.C. Formulary Committee, or some other authoritative body, took this matter in hand, if hydrastin is to maintain the confidence of the medical profession. Further, if the Committee had supplied a reliable process they would have rendered a most meritorious service to pharmacy. Unfortunately, they have, in my judgment, erred in adopting this particular process. It is not fair to assume the name of a drug which has a recognised character in the country where it originated, and to give a formula for its preparation which yields a product vastly inferior to five-sixths of what is sold in America. It would have been a comparatively simple matter to have ascertained by analysis or otherwise the composition of the best hydrastin on the market, and then to have framed a standard, which they could have based on the total alkaloid, or preferably, as the Ph. Germanica has done, on the hydrastine alone.

I suggest that in the next issue of the Formulary the name of this preparation be changed to Extractum hydrastis siccum, that a stronger alcoholic menstruum be employed, and that the extract be standardised to contain 10 per cent. of white alkaloid (hydrastine), or 20 per cent. total alkaloids, of which at least two-fifths should be hydrastine. If it be desired to include a hydrastin concentration. it would be sufficient to describe its characters, and to say that it should contain double the alkaloids in the extract.

I wish to add that I am indebted to Dr. Francis, of the pharmacal laboratory of Parke, Davis, and Co., Detroit, for much valuable information.

Mr. Martin said he thought this paper hardly called for discussion, but the Formulary Committee would carefully consider it, He would only make one remark in connection with the reference made to the fact that formulæ were sometimes transferred from the Formulary to the Pharmacopœia. In the last edition of the Pharmacopœia synonyms were introduced, the authorities going so far as to give "Gregory's powder" as a synonym for Pulv. Rhei. Co. One of the formulæ transferred from the Formulary was elixir of cascara sagrada, with the simple alteration that the last item was placed first, but it was called syrupus cascaræ aromaticus. That was certainly a case in which the synonym should have been given, if only for the convenience of pharmacists, who might have the identical article on their shelves, but might not recognise it under the new name.

The author was cordially thanked for the above paper.

Owing to the number of papers and the length of the discussions, the following paper, at the suggestion of the author, was taken as read.

The cordial thanks of the meeting were accorded to Dr. McWalter.

THE PREPARATIONS OF ERGOT.

By J. C. McWalter, F.F.P.S. (Glas.).

The position of ergot is unique, both in medicine and in pharmacy. Few drugs have such a definite physiological action, and scarcely one is known whose properties are so characteristic. Yet the pharmacy of ergot is rather a reproach to British chemists, and the extractum ergotæ fluid. of the Pharmacopœia, supposed to represent the summit of scientific skill at the end of the nineteenth century, is a wretched product, which it behoves the Conference to have removed from its pages. The ergotin of the Pharmacopœia, or rather the solid extract, is a creditable scientific preparation of definite physiological action and tolerably uniform strength.

When Bonjean first reported on ergotin he considered that it consisted of two definite principles, but both alike active. One was the soft reddish-brown extract, soluble in water, so familar to you all, and the other was a fixed oil, of which ergot yielded some 30 per cent., soluble in alcohol, ether, and caustic alkali solutions. It is now believed that ergotin should be regarded as a collective term, which comprises most of the active principles of ergot, minus the oil, resin, sphacelinic acid, and sclererythrin. The problem for pharmacy is to reduce this to a more definite active principle, or at least to produce it of still more definite weight and consistence.

Although the extractum ergotæ of the B.P. is popularly supposed to yield a product similar to that first popularised by Bonjean, it must be observed that the latter extracted the drug with water, and purified the product by alcohol, whilst the pharmacopœial preparation is made by extracting the drug with weak alcohol and treating the resultant with water. Further, the weak alcoholic extract, from which the B.P. extract is now made, is practically the tinctura ergotæ of the old Dublin Pharmacopœia which was generally regarded as a miracle of inertness. Again, although the oil is now looked on as worthless, Dr. Wright formerly regarded it as the active principle of the ergot, and the ammoniated tincture of the present Pharmacopœia seems to survive out of respect to the superstition that an alkaline solution must then be

the proper medium to extract an oleaginous substance. The infusum ergotæ never had any considerable repute, and most of that found in pharmacy is comparatively worthless, but this is rather the fault of pharmacy, for a fresh infusion made from freshly bruised and fresh ergot will probably be found to contain a larger proportion of the alkaloid than the equivalent of the tincture or fluid extract. At the same time I cannot regard it as proved that the alkaloid is a definite measure of the potency of ergot. The proportion of solid extract in honestly made fluid preparations of ergot may be regarded as a rough mark of their potency. Bonjean found that 500 parts of ergot yielded 50 to 70 parts of ergotin, perhaps 10 to 14 per cent. The present fluid extract of the B.P. varies from 11 to 16 per cent., and the tincture from 3 to 3·5 per cent. Squibb's ergot, of great repute in some parts, yields, according to my examination, about 11 per cent. Kobert says that cornutine is the active constituent and is contained in the alcoholic extract with sphacelinic acid after removal of the fat. He also points out what is the experience of every one here present—that all aqueous extracts go bad after nine months; this he asserts to be due to the decomposition of the cornutine, and is probably correct, but I have found that extracts of ergot which had developed a strong fetid odour still possessed marked action on the fibrous tissue of the blood vessels and capillaries—a fact which seems to suggest that cornutine is not the sole active constituent.

According to Keller, ergotin comprises sclererythrin, secolin, the ergotinum of Timet, the cornutine of Kobert and decersklertin of Dragendorff. Jacobi also considers cornutine to be the active principle, but he also regards sphaceletoxin and resins as important constituents. This acid is non-nitrogenous and unstable, insoluble in water, but soluble in alkaline solution. It produces tonic contraction of the uterus and contracts blood vessels. Cornutine is insoluble in water and produces rhythmic contractions of the uterus, exactly like those which occur in nature. Seeing that those important bodies are insoluble in water, though soluble in alkaline solution, it is strange that Kobert recommends dilute hydrochloric acid as a solvent. Hal White states that the odour of ergot is due to trimethylamine, and that the other active principles are ergotinic acid, ergotinine and sclerotinic acid. This latter acid is believed to be a compound of sphacelinic acid and cornutine. Trimethylamine I believe to be a decomposition product. It is very obvious after the distillation of an old liquid extract of ergot,

and then gives an odour very unlike that of fresh ergot or its extract. This latter point is of some commercial importance, because the question came before an analyst in Dublin lately, whether he should pronounce as B.P. a liquid extract of ergot which gave decided indications of trimethylamine on distillation. On the whole I rather think that trimethylamine is a decomposition product of ergot; the better and fresher made the sample the less is the trace of it. The so-called aseptic ergot appears to be almost free of it, whilst its presence in quantity is responsible for the fetidly fishy odour of old liquid extracts. It has been suggested that a formula might well be devised by which a fluid extract might be obtained from the present extractum ergotæ, and the fluid extract of the Pharmacopœia superseded. I find that a solution which keeps very well can be made simply by dissolving one part of ergotine and one of glycerin with a sufficiency of distilled water to produce five parts. This solution will be about 5 per cent. stronger than a well made liquid extract, and will be altogether more reliable. It is also rather palatable, and this is an important element, for if patients suffering from hæmorrhage are given a dose of ergot and it happens to nauseate them, their fright is naturally intensified and the chances of relief thus diminished.

Elaborate methods have been adopted by certain American manufacturers to assay ergot on a physiological basis, namely--by ascertaining the quantity required to produce the phenomenon known as ergotism on the comb of a cock, whereby this appendage is attacked with dry gangrene as the result of ergot. The potency of the extract is assayed in proportion to the weight of the cock. Now I submit that such experiments are based on a completely erroneous assumption, namely, that the principle in ergot which causes the contraction of the unstriped tissue of the minute blood vessels is the active ingredient; besides, the human factor is quite lost sight of. The fact is that there are two distinct physiologically active principles in ergot, the one probably cornutine, which produces the rhythmic contraction of the uterus, which renders ergot of so much use in obstetrics, and the other, sphacelinic acid, sphacelotoxin, or some other principle or combination of principles which produce contraction of the fibrous tissue of the capillaries and are responsible for the employment of ergot in hæmorrhages, as well as in the various nervous affections where such contraction is desirable.

Now, the explanation of the praise and the blame which has

been so lavishly bestowed on the various preparations of ergot is simply that one or other of these principles was present in the preparation to a preponderating extent, and according to the purpose for which the practitioner used it did he obtain results and loved ordering it.

According to my observations very many indifferent preparations of ergot will produce that tonic contraction of the uterus which is desired in labour; any kind of a moderately good fluid extract will produce it in twenty minutes, and the organ responds to the drug under the practitioner's hand in an extraordinarily definite fashion, which marks its action so definitely that experiments on the combs and wattles of fowl seem but childish bye-play. But quite a different state of affairs is found if uterine hæmorrhage sets in. Then, indeed, one wants to contract the capillaries as well as the unstriped muscle, and in such cases only an efficient preparation is of any use. In this condition, as in the more ordinary but troublesome cases of metrorrhagia, the fluid extract of the Pharmacopœia demonstrates its incompetence and unreliability, and the more scientifically prepared extracts show their worth. Now the extractum ergotæ, B.P., can generally be relied on in these cases, but it needs to have its consistency more accurately defined, as at present it may vary in moisture 10 per cent., more or less. Although aqueous extracts of ergot are in general to be condemned, a fresh infusion, made with fresh ergot, freshly bruised, seems to be more active. The disrepute into which it has fallen is due, I grieve to say. to the action of pharmacists in preparing it from the coarsely powdered ergot of the stock bottle, from old ergot, from concentrated infusions, and from the fluid extract. The ammoniated tincture of ergot is moderately active, as cornutine is soluble in alkalies; but is so weak that a dose containing a sufficiency of ergotin contains such an excess of ammonia as to sicken the patient. It yields only about 4 per cent. of extractive as against about 15 per cent., in the fluid extract, and its alkaline basis makes a difficulty about prescribing it with salts of iron.

Although extractive may mean anything, the amount of extractive yielded by an honestly made preparation of ergot appears to bear a very definite relation to its value; and this is a means of roughly standardising which is open to the pharmacist who has not an aviary of roosters to experiment on.

The preparation used on the Continent under the name of ergotinal is twice as strong as our tincture, but though recommended

for subcutaneous injection it seems rather painful unless mixed with cocaine. Keller's ergotin is said to embrace all the active principles with the exception of sphacelotoxic acid, and cornutine can readily be demonstrated in it.

Merck describes a preparation containing an admixture of aqua laurocerasi made by depriving secale cornuta of its fat, and exhausting it in dilute tartaric acid solution. The effect of the solution seems to bear out the theory that the ecbolic extractives of ergot are soluble mostly in alkaline solutions, and that the capillaro-contractive constituents are soluble in acid or alcoholic solutions. The ergotine of Wigger is interesting as containing part of the oil, which in later times has been decided as useless, though at one period claimed as the active principle. It is a reddish-brown powder, soluble in warm alcohol, and is almost exclusively sphacelinic acid, being much more concentrated than our ergotine; the dose is about 1 grain.

The extractum ergotæ, B.P., contains a notable percentage of salts, and many have supposed that its virtues largely depend on these when used subcutaneously. Wernick treats an aqueous extract with alcohol and ether, and dialyses the product. This contains the natural salts in considerable proportion, and is looked on as one of the best for hypodermic administration. Latter-day pharmacologists who have condemned the oil of ergot as worthless have been faced with the problem that some obstetricians find that an infusion of freshly-powdered ergot, which certainly contains the oil, has a specific action in overcoming uterine atony, which seems wanting in all the other preparations. Kohlman makes an extract containing all the oily constituents, and the action of this is the same as fresh ergot. Bombelon points out that extracts of fresh ergot form excellent culture media for fungi, and recommends that ergotine should be prepared for solution by dissolving four parts in one of alcohol and three of laurel water.

Houghton states in the *Pharmaceutical Journal* "that 50 to 70 per cent. of the ergot of commerce is inert. He comes to this conclusion by testing its effects in producing gangrene of the combs and wattles of fowls, and states that he has had to destroy as much as 2,000 pounds of it as worthless." I have already pointed out that the capillaro-constrictive properties of ergot, which are the only ones that can possibly be tested by this method, bear no necessary proportion to the ecbolic effects and hence such samples may have been moderately effective in the latter direction. It is, however, probably true that the capillaro-

constrictive effects are a better measure of the all-round efficacy of a given sample.

The conclusions as to preparations of ergot would seem to be these: (1) Ergot has at least two distinct actions, one on the uterus, the other on the blood vessels, and pharmacists should have preparations possessing one or other of these properties in the most active degree. (2) Ergot comprises a number of distinct chemical substances, but so few of these can be recognised as definite entities, and so many different names have been applied to them, that it is premature to decide whether cornutine or any other alkaloid is the active principle. (3) The extractum ergotæ of the B.P. is a fairly satisfactory product, but ought to be regulated to a definite consistency. The fluid extract is a poor article, and a much better solution can be obtained by dissolving one part of the extract and one of glycerin in a sufficiency of distilled water to make five parts. (4) The ammoniated tincture has a moderately effective action in constricting the capillaries, but is not suitable for obstetric work, being weak, bulky, bitter and nauseous. (5) When fresh ergot is bruised and an infusion made and drunk immediately, the active principles are obtained in as correct proportion as in the most elaborate extracts; but an infusion made from old ergot powdered even for a week, or concentrated infusions, are a disgrace to pharmacy. (6) Trimethylamine is a decomposition product, and its existence denotes deterioration of the sample.

The following paper was then read:

LIQUOR CALUMBÆ CONCENTRATUS AND OTHER B.P. CONCENTRATED LIQUORS.

By F. C. J. Bird.

Of the ten official liquores concentrati three only, viz.: cusparia, quassia, and serpentary can be considered quite satisfactory in respect of uniformity of composition and freedom from deposit on keeping. Copious precipitation is the chief characteristic of the others. In some cases this goes on for a certain time only, the liquid afterwards remaining permanently bright, whilst in others deposition takes place for an almost indefinite period, thus affecting the physical characters and possibly the activity of the preparation. It seems desirable, therefore, to ascertain by experiment if

these faults are inseparable from the formulæ, or if by amendment or modification of the latter they can be so corrected that products may be obtained from them which shall always be uniform in composition and capable of keeping unchanged for any reasonable length of time.

Liquor Calumbæ Conc.

At the last meeting of the Conference in Ireland it was stated in reference to this formula that the "characters of the product would depend entirely on the power of the press." This statement has since been practically investigated by Mr. A. C. Abraham, who showed that when using a hand-press the finished liquor had a sp. gr. of 1·029 and extractive 2·16 per cent., whilst with a powerful hydraulic press these figures became respectively 1·032 and 3·66. An inspection of the formula even suggests this result, for in the first instance (hand-press) the volume of the expressed liquid being smaller, and the quantity of spirit added remaining the same, the proportion of alcohol in the mixture is greater, and precipitation consequently is more copious. Loss of extractive therefore follows both from the diminished amount in the pressings and the larger quantity precipitated by the spirit; there is also much loss of alcohol owing to the greater alcoholic strength of the liquid absorbed by the filter paper and the more voluminous precipitate. There is no compensation for this in the official process, as the deficiency of the volume is directed to be made up by addition of water to the filtrate.

The formula for liq. calumbæ conc. is one which furnishes a preparation, varying greatly according to the conditions of manufacture, both in extractive and percentage of alcohol, a low proportion of the latter bringing in its train a continuous deposition of sediment from the development of acidity in the liquid.

It may not be out of place to allude here to the custom of basing an opinion of the genuine B.P. nature of a preparation of this kind on the presence of a certain amount of extractive and percentage of alcohol. The limits of variation are apparently ascertained by the examination of commercial samples, usually emanating from a manufacturing laboratory. It has been shown that the liquors prepared on the retail and manufacturing scales may possess widely varying characters, and whilst this formula exists in the Pharmacopœia it seems possible that injustice may be done and the conscientiously prepared article of the small operator or retail pharmacist suffer unfair condemnation. Indeed, it would perhaps

be more rational to take the characters of a preparation made on the small scale as a standard until a given formula has been investigated and its defects, if any, made known. But clearly the desideratum in every official formula is that it should furnish a uniform product under every condition of manufacture.

The modifications of the official process for liq. calumbæ conc. which I venture to suggest, are the following: (1) The substitution of chloroform water for distilled water in order to prevent incipient fermentation or souring. A fresh aqueous infusion of calumba is neutral in reaction; even slight acidity causes turbidity and slow precipitation in the finished concentrated liquor. (2) The use of a quantity of chloroform water for the second maceration equal to the difference between the volume of the first pressings and 16 fl. ozs. (in the B.P. formula), so that the mixed expressed liquids may measure 16 fl. ozs. (3) The removal of suspended matters, starch, etc. (often very considerable in amount) by allowing the mixed liquors to remain at rest for twelve hours, decanting the clear portion and washing the sediment with a little chloroform water. (4) The raising of the temperature ordered in the B.P. from 180° to 212°, starch being absent, the liquid after heating being quickly cooled and made up with boiled distilled water to 16 fl. ozs. before the addition of the spirit.

On setting aside to clear, decanting, and filtering through a small filter, a finished product of 20 fl. ozs. can be obtained without difficulty. Operating on clear liquor only in the process, but little precipitation is produced by the spirit, and loss of alcohol is reduced to a minimum. The advantages of the higher temperature are that the final liquor filters more readily, is brighter, and keeps better.

The figures given below relate to two samples of liquor calumbæ conc. prepared in accordance with the above suggestions—the one, A, being heated to 180° F., as the B.P. directs, and the other, B, to 212° F.

The calumba root used yielded (by the aliquot part method):

Aqueous extractive . . .	14·4 per cent. w.v.
Alcoholic (20 per cent.) extractive .	13·2 „ „

	Sp. gr.	Extractive.			Extractive removed from Drug.
A					
Clear expressed liquid (16 fl. ozs.)	1·215	4·8 per cent. w.v.		=7·7 per cent.	
Finished liquor . . .	0·9914	3·7	„	„ =7·4	„
B					
Finished liquor . . .	0·9914	3·7	„	„ =7·4	„

It will be noticed that whilst the total extractive obtainable from the calumba root itself by 20 per cent. alcohol was 13·2 per cent. the official liquor had removed but 7·4 per cent., and as shown by Abraham, if prepared with the aid of a hand-press this proportion might fall as low as about 4·3 per cent., or about one-third the available soluble matter.

Fair uniformity may be expected in this liquor when the foregoing suggestions are adopted—the result is certainly not the unsightly product usually credited to the B.P. formula. But to bring this liquor into line with the others in the processes for which more complete exhaustion of the drug appears to be aimed at, a better method than maceration and pressure must be employed for the extraction of the calumba root. Slow percolation with chloroform water is much more effective, but it must be noted that from a given sample of drug the "concentrated liquor" will be nearly half as strong again as a similar preparation by the official process. The root in No. 5 powder, as free from dust as possible, should be macerated with an equal weight of chloroform water, packed lightly in a percolator, and (with B.P. quantities) percolation continued with chloroform water to 16 fl. ozs., the remainder of the process being continued according to the suggestions already given. The percolate should pass through layers of lint and sand at the orifice of the percolator, so that it may come off bright and free from sediment. A sample of liquor calumbæ conc. made by percolation gave the following figures:

Calumba Root used. Extractive (aqueous) 14·4 per cent.
„ (alcoholic) 20 per cent. 13·2 p.c.

	Sp. gr.	Extractive.		Extractive removed from Drug.
(*a*) Percolate (16 fl. ozs.)	1·307	6·8 per cent.	=	10·8 per cent.
„ (2NO 16 fl. ozs.)		0·9 „	=	1·44 „
				12·24 „
Finished Liquor from (*a*)	0·990	5·2 per cent.	=	10·4 per cent.

„ „ Alcohol 20·4 per cent. by volume.

The official liquor containing 7·4 per cent. of extractive out of a possible 13·2, a liquor by percolation from the same sample of drug removes 10·4 per cent., or nearly half as much again. This increase in strength is fully borne out by the respective degrees of bitterness of the two liquors on dilution. The prevention of incipient fermentation, the avoidance of loss of alcohol, and the maintenance

of a neutral reaction are, briefly, the essentials of a permanent liquor calumbæ concentratus.

Liquor Senegæ Conc.

With the exception of calumba, compound sarsaparilla and senega, the B.P. liquores concentrati are prepared by what may be termed a time-percolation method which, however, has been somewhat facetiously charged with necessitating a day and night service for the proper carrying out of its details. Curious and novel as the directions "to add the remaining menstruum in ten equal portions at intervals of twelve hours" appear to be, the principle is a thoroughly good one, and there is more in the process than at first glance meets the eye. It is in fact a kind of re-percolation which ensures the almost complete exhaustion of the drug. It gives particularly good results with senega; even on the small scale the percolate contains over 95 per cent. of the total soluble matter capable of being extracted by the menstruum.

Deposition in liquor senegæ conc. may be partly due to variation in the alcoholic strength of the menstruum, but is more particularly attributable to the natural acidity of the drug itself. A strong tincture of senega in 28·45 per cent. alcohol possesses a very pronounced acid reaction, and the drug itself usually contains moisture. In the recently powdered root this amounted to 7·5 per cent.

A sample of liquor senegæ conc. was prepared by the B.P. method, sufficient alcohol being added to the menstruum used for moistening the senega to compensate for the moisture in the powdered root, and the percolation conducted in an air-tight apparatus so arranged that the required quantity of menstruum could be run in by a tap at the proper intervals. The percolate, which came off clear and brilliant, very gradually but continuously threw down a whitish gelatinous deposit (probably sapogenin), the supernatant liquid still remaining bright. From the appearance of the liquor it seemed likely that this precipitate resulted solely from the decomposition of the senegin, brought about by the natural acidity of the liquid. The bright portion was, therefore, decanted, one-fourth of its volume set aside, and the remainder just made alkaline by the cautious addition of solution of ammonia. The part set aside was then added, the final reaction being *faintly but distinctly acid.* Liq. senegæ conc., B.P., containing the full percentage of alcohol, and with its acidity partially neutralized, keeps well, and may be regarded as a satisfactory preparation.

Doubtless the formulæ of the other official concentrated liquors would respond to investigation. These preparations have a position in the Pharmacopœia which promises to be a lasting one; with the defects of their processes eliminated, and possessing the indispensable qualifications of uniformity of composition and permanence, they may eventually attain that popularity which, in their present condition, they certainly do not appear to enjoy.

The discussions of the above and following papers took place together after a summary of the latter had been given by Mr. NAYLOR in the absence of the authors.

NOTE ON LIQUOR GENTIANÆ COMPOSITUS CONCENTRATUS.

By E. H. FARR, F.C.S., AND R. WRIGHT, F.C.S.,

Pharmaceutical Chemists.

This is by far the most frequently used of all the so-called concentrated infusions, but for some reason it has not been included in the British Pharmacopœia. Is it not possible to prepare a concentrated preparation which will, on dilution, fairly represent the freshly-prepared official infusion? The experiments here detailed were carried out with the object of furnishing a reply to this question.

(A) SOLVENT ACTION OF BOILING WATER ON DRIED BITTER ORANGE PEEL.

Fifty-five grains of the peel was cut small and infused in half a pint of boiling water for fifteen minutes, the infusion strained and allowed to cool.

No. 1.			
25 c.c. yielded	0·061 Gm. residue dried at 100° C.	= 0·244 Gm.	from 100 c.c.
No. 2.			
25 c.c. „	0·077 „ „ „ „ „	= 0·308 „	„ „
No. 3.			
25 c.c. „	0·071 „ „ „ „ „	= 0·284 „	,
Average =	0·070	0·280	

(B) Solvent Action of Boiling Water on Gentian Root.

Fifty-five grains of the thinly sliced root was infused in half a pint of boiling water for fifteen minutes, the infusion strained and allowed to cool.

No. 1. Small roots.	25 c.c. gave 0·042 Gm. residue dried at 100° C.	= 0·168 Gm. from 100 c.c.
No. 2. Medium-sized roots	25 c.c. gave 0·049 Gm. residue dried at 100° C.	= 0·196 Gm. from 100 c.c.
No. 3. Large-sized roots	25 c.c. gave 0·073 Gm. residue dried at 100° C.	= 0·292 Gm. from 100 c.c.
	Mean = 0·053	0·220

From a second batch of roots the results were as follows :—

No. 1. Small roots	25 c.c. gave 0·089 Gm. residue dried at 100° C.	= 0·356 Gm. from 100 c.c.
No. 2. Medium roots	25 c.c. gave 0·096 Gm. residue dried at 100° C.	= 0·384 Gm. from 100 c.c.
No. 3. Large roots	25 c.c. gave 0·099 Gm. residue dried at 100° C.	= 0·396 Gm. from 100 c.c.
	Mean = 0·095	0·380

It was remarked that the small roots gave the most bitter infusions, though lowest in extractive value.

(C) Solvent Action of Boiling Water on Lemon Peel.

One quarter ounce fresh lemon peel cut small was infused in half-a-pint of boiling water for fifteen minutes, the infusion strained and allowed to cool.

No. 1.	25 c.c. gave 0·024 Gm. residue dried at 100° C.	= 0·096 from 100 c.c.
No. 2.	25 c.c. „ 0·021 „ „ „ „ „	= 0·084 „ „
No. 3.	25 c.c. „ 0·028 „ „ „ „ „	= 0·112 „ „
	Mean = 0·024	0·072

Neither of these infusions possessed more than a trace of the aroma and fragrance of the lemon, and very little of the aromatic bitter taste characteristic of the fresh peel. By practical experiment it was found that a simple infusion of lemon, using the

proportion of peel to menstruum contained in the official compound infusion of gentian, was not equal either in aroma or flavour to the product of admixture of a fluid drachm of the official tincture with a pint of distilled water. 110 grains lemon peel lost in drying 78 grains = 71 per cent. of its weight. The residue when infused for fifteen minutes in half-a-pint of boiling water yielded an infusion 25 c.c. of which gave 0·040 Gm. residue dried at 100° C. = 0·160 Gm. from 100 c.c.

From the above data it would appear that the residue from 100 c.c. official compound infusion of gentian, dried at 100° C., should amount to not less than 0·6 to 0·7 Gm.

(D) Compound Infusion of Gentian.

No. 1.	25 c.c. = 0·199 Gm. dry residue at 100° C.	= 0·796 Gm. from 100 c.c.	
No. 2.	25 c.c. = 0·188 „ „ „ „ „	= 0·753 „ „ „	
Mean =	0·194	0·776	

A third infusion was prepared from gentian root and orange peel only, and tincture of lemon in the proportion of two fluid drachms to the pint added to the finished product. This was superior to the official preparation, both in aroma and flavour. Of this 25 c.c. gave 0·136 Gm. residue dried at 100° C. = 0·544 Gm. from 100 c.c.

For the experimental processes for the liquor a quantity of gentian root and bitter orange peel was carefully dried at a low temperature, reduced to coarse powder, and sifted through sieves of the requisite degree of coarseness.

Experiment No. I.—Liquor Gentianæ Compositus Concentratus, 1 to 9.

Take of —

Dried bitter orange peel in No. 10 powder	4 ozs.
Dried gentian root in No. 10 powder	4 ozs.
Dried lemon peel in No. 10 powder	2 ozs.

A mixture of 1 volume, 90 per cent. alcohol, with 3 volumes distilled water — a sufficient quantity.

Mix the powders, moisten uniformly with 12 fluid ozs. diluted alcohol, set aside in a closely covered vessel for twelve hours. Pack in a series of four percolators and extract by re-percolation, using more of the diluted alcohol for the purpose. When 35 fluid ozs. has been used and percolation has ceased, mix the marcs and

express. Mix the liquids, adjust the volume to 32 fluid ozs. with diluted alcohol, set aside for forty-eight hours; filter.

NOTES.—(1) Lemon peel loses almost 75 per cent. of its weight in drying; 2 ozs. of the dried equal practically 8 ozs. fresh peel. (2) The process yields a good product, but is slow and tedious in operation.

EXPERIMENT NO. II.—LIQUOR GENTIANÆ COMPOSITUS CONCENTRATUS, 1 to 9.

Take of—

Dried bitter orange peel in No. 10 powder . . .	4 ozs.
Dried gentian root in No. 10 powder	4 ozs.
Gratings of fresh lemon peel	8 ozs.
Alcohol (90 per cent.)	4 fluid ozs.

A mixture of 1 volume (90 per cent.) alcohol and 3 volumes distilled water —a sufficient quantity.

Mix the powders, moisten uniformly with 12 fluid ozs. diluted alcohol, set aside in a covered vessel for twelve hours. Mix the lemon peel with 4 fluid ozs. (90 per cent.) alcohol, set aside in a covered vessel for twelve hours. Mix all well together, pack in a series of four percolators, and extract by re-percolation with diluted alcohol. When 35 fluid ozs. menstruum has been used and percolation is complete, mix the marcs and express. Mix the liquids, adjust to 32 fluid ozs. with diluted alcohol, set aside for forty-eight hours, filter.

NOTE.—This form is drawn on the assumption that the lemon peel is used both as an aromatic bitter and as a flavouring agent. It is slow, but gives a very satisfactory product.

EXPERIMENT NO. III.—INFUSUM GENTIANÆ COMPOSITUM CONCENTRATUM, 1 to 7.

Take of—

Gentian root, dried in No. 20 powder .	2 ozs.
Dried bitter orange peel in No. 20 powder	2 ozs.
Dried lemon peel in No. 20 powder . .	1 oz.
[1] Tincture of fresh lemon peel . . .	1 fluid oz.
Alcohol (90 per cent.)	4 fluid ozs.
Distilled water	A sufficient quantity.

Mix the powders, pour over them a pint of distilled water, set

[1] This is made by taking the grated outside peel of fresh lemons, 2 ozs. : alcohol (90 per cent.), 4 fluid ozs. Macerate and filter.

aside for twenty-four hours, express. Reserve 10 fluid ozs., to which add the tincture and the alcohol. Treat the marc with two further macerations of 1 pint of distilled water of six hours each, press off, mix the liquors, adding any left from the first maceration. Evaporate to 5 fluid ozs., and add it to the first portion to make a pint.

NOTES.—(1) The product of the first expression, using a small hand-press, measured 14¾ ozs. (2) The evaporation over a water bath occupied six hours.

The foregoing process was one of several proposed for insertion in the Conference Formulary, and with a view of shortening and simplifying it, the following modifications were attempted :—

EXPERIMENT NO. IV.—INFUSUM GENTIANÆ COMPOSITUM CONCENTRATUM, 1 to 7.

This was made precisely as No. III., but : (1) Boiling water was substituted for cold, and the time of infusion shortened to two hours in each case. (2) Four ounces of the official tincture of lemon, and 2 fluid ozs. (90 per cent.) alcohol was substituted for the special tincture and alcohol.

NOTE.—The products of infusion with boiling water are too viscid, and on the addition of alcohol a considerable deposit of pectinous matter occurs.

EXPERIMENT NO. V.—INFUSUM GENTIANÆ COMPOSITUM CONCENTRATUM, 1 to 7.

This was carried out like No. IV., except that : (1) The times of infusion were six, three, and three hours. (2) The dried lemon peel was omitted. (3) Two fluid ounces tinct. limonis, B.P.C., and 3½ fluid ozs. (90 per cent.) alcohol was added to the concentrated infusion.

NOTE.—The observation made under No. IV. also applies in this case. The aroma, etc., of these preparations is satisfactory, but they deposit after the first filtration, and are moreover deficient in bitterness.

EXPERIMENT NO. VI.—INFUSUM GENTIANÆ COMPOSITUM CONCENTRATUM, 1 to 7.

This was carried out as No. V., the time of the first infusion being extended to twelve hours. The product did not deposit so much as those of the two prior experiments, but was still deficient in bitterness.

Experiment No. VII.—Liquor Gentianæ Compositus Concentratus, 1 to 9.

Take of—

Dried bitter orange peel in No. 10 powder . . .	4 ozs.
Dried gentian root in No. 10 powder	4 ozs.
Gratings of fresh lemon peel	8 ozs.
Alcohol (90 per cent.)	2 fluid ozs.

A mixture of 1 volume (90 per cent.) alcohol with 3 volumes distilled water —a sufficient quantity.

Moisten the mixed powders with half-a-pint of the diluted alcohol, place in a closely covered vessel, set aside for twelve hours. Similarly mix the lemon peel gratings with 2 fluid ozs. (90 per cent.) alcohol, and set aside (to convert water in the peel, into menstruum). Mix, pack the whole tightly in a percolator, and percolate with a pint of diluted alcohol. Express the marc, mix the liquids, adjust to 32 fluid ozs. with diluted alcohol, set aside for forty-eight hours, filter.

Note.—Percolate = 17 fluid ozs., pressings = 13½ fluid ozs.

Experiment No. VIII.—Liquor Gentianæ Compositus Concentratus, 1 to 7.

Take of—

Dried gentian root in No. 10 powder. .	4 ozs.
Dried bitter orange peel in No. 10 powder	4 ozs.
Tincture of lemon (B.P.)	4 fluid ozs.
Alcohol, 90 per cent.	7 fluid ozs.
Distilled water	A sufficient quantity.

Moisten the powder with half-a-pint of distilled water, set aside in a covered vessel for twelve hours, pack tightly in a percolator, and adding more water, continue percolation until 29 fluid ozs. percolate has been collected. Add the tincture and alcohol with a sufficient quantity of distilled water to produce one quart. Set aside for forty-eight hours, filter.

Note.—This process works excellently and the product is very satisfactory.

Experiment No. IX.—Liquor Gentianæ Compositus Concentratus 1 to 7.

This was conducted precisely as No. VIII., but the gentian root and peel were in No. 20 powder.

Experiment No. X.—Liquor Gentianæ Compositus Concentratus, 1 to 9.

This was conducted exactly as the last, percolation being stopped when 23 fluid ozs. percolate had been collected. To this was added 4 fluid ozs. tincture of lemon B.P. and 5 fluid ozs. (90 per cent.) alcohol.

Table Showing Specific Gravity and Yield of Extraction of the Concentrated Liquors.

No.	Specific Gravity.	Extract dried at 100° C. in Gm. from 100 c.c.	Degree of Concentration.
1	1·014	8·78	1 to 9
2	1·014	8·78	1 to 9
3	1·005	7·90	1 to 7
4	1·013	9·65	1 to 7
5	1·014	8·30	1 to 7
6	1·005	7·80	1 to 7
7	1·020	10·50	1 to 9
8	1·004	7·70	1 to 7
9	1·003	7·65	1 to 7
10	1·012	9·00	1 to 9

The standards for extractive, based upon the yield from a freshly prepared infusion, are 6·2 Gm. per 100 c.c. for a 1 to 7 preparation, and 7·8 for a 1 to 9 preparation. These afford a fair indication of the value of such preparations. They are only approximate, the therapeutic value probably depending upon the proportion of bitter and aromatic principles present, which cannot with accuracy be determined.

In examining the products of the different processes the specific gravities and extractives were first taken, with the results shown on the accompanying table. It will be seen that the extractive value is in every case above the standard arrived at by calculation from the figures for the official infusion. In the further examination of the samples, comparing them first *inter se*, and then comparing the products of their dilution with the official preparation, we were assisted by several pharmacists to whom samples were sent for comparison. Of these, two selected No. 3, two others No. 9, while a fifth declared that he could not decide between the two. Our own judgment is that there is little to choose between the products of Nos. 3, 8, and 9, No. 3 being rather more bitter, though Nos. 8 and 9 have decidedly the better flavour. We may say that all the liquors, except those in which boiling water was used for

the maceration, have kept well; no precipitation has taken place, and the flavour and aroma appear to be quite unimpaired. Samples of the principal ones are on the table. These were made seven months ago.

The PRESIDENT said he had been examining the infusions of gentian, and selected No. 8 as the one he preferred.

Dr. ATTFIELD said he would support Mr. Bird's last paragraph, in which he alluded to the position of "liquors." There was a strong desire on the part of medical practitioners to have such preparations; they only wanted to know definitely what they were prescribing. Twenty-five such preparations were carefully examined by the Pharmacopœia Committees, but only ten were admitted, because the other fifteen were more or less unsatisfactory in some respect. It was for pharmacists to criticise and improve those which had been admitted, and to add to their number. The very important action of chloroform water did not seem to have affected the flavour or odour of Mr. Bird's product; that was important, because patients would not like the flavour of chloroform where it was not expected. With regard to Messrs. Farr and Wright's paper, he noticed that, while they appeared to aim at a strength of 1 in 10, the three they partly recommended were 1 in 8. Considering the increasing general tendency of all nations to adopt the decimal system, he would suggest that an attempt be made to produce those three, indeed all such liquors, of the strength of 1 in 10.

Mr. MARTIN said he had made inquiries as to the extent to which the 1 in 10 concentrated infusions of the new Pharmacopœia were coming into use, and the reply he got from a great number of houses was that after the first two or three months the sale had fallen quite flat. On this side of the Channel, however, he understood they were taken up largely. It was not of much importance, except as to the amount of soluble matter which could be retained in solution. He thought Dr. Attfield lived a little too much in the future; the decimal system was not yet in general use, and all their bottles were made to hold 8 ozs., 6 ozs., and 4 ozs., and therefore a proportion of 1 in 8 was more convenient than 1 in 10. The concentrated infusion of gentian in the Formulary corresponded very closely with the one given in the paper, and he would like to know whether members who had tested it had found it satisfactory.

Dr. SYMES said one impediment to the more extended use generally of these "liquors" was that those of the Pharmacopœia

had been made to correspond to 1 in 10 strength rather than 1 in 8. The eight oz. bottle was generally used by the practitioner who dispensed his own medicines, and in getting in advance of the times he felt sure they were tending to impede the use of such "liquors." He was indebted to Mr. Bird for suggesting the use of chloroform water. During the process there was always a tendency to change, and he did not think that pharmacists generally had always estimated the large amount of change that took place in the process of manufacture; therefore, if the chloroform was so perfectly eliminated as not to be perceptible in the finished product the use of chloroform water was a decided advance.

Mr. Brodie said, although he had a very powerful hand-press, he never attempted to prepare the concentrated "liquors" by maceration and subsequent pressure, he had always prepared them by percolation adding the spirit afterwards. He thought, reasoning from analogy, that the expressed "liquor" would not filter easily, for he found that in pressing the marc of a tincture what was pressed out was always difficult and slow of filtration. In a paper read some time ago, at a meeting of the North British Branch on Liq. Ext. Cascaræ Sagradæ, the author said that in his experience it continued to deposit to the end of the chapter. He (Mr. Brodie) had never found it continue to deposit after the first filtration, and the same with liq. calumbæ.

Dr. McWalter said the suggestion of the use of chloroform water was somewhat revolutionary. He would ask Mr. Bird whether he meant the saturated solution of chloroform in water of the old Pharmacopœia or that of the present Pharmacopœia? He had noticed that a number of substances soluble in distilled water were insoluble in chloroform water. The exact cause of the deposits in the case of these "liquors" had been largely overlooked by manufacturers. It might be that when they were sent out they were fairly good, but after they had been standing on the shelves of a pharmacy after a time there was some change, and they deposited more and more as the solution became more acid.

Mr. Bird, in reply, said in the discussion on a former paper Mr. Rutherford Hill had spoken of liquid extracts containing certain things which reacted on each other, and he (Mr. Bird) thought that liq. senegæ, the natural acidity of which gradually decomposed the senegin, was an illustration of that. With regard to a liquid extract being a bad form of preparation, it was not exactly the form, but the peculiarity of the preparations in question which made them apparently unsatisfactory, there probably being some disturbing

element present which pharmacists must find out, and the influence of which they must devise some means of counteracting. Chloroform water was only used as a preservative during the maceration stage, and the infusion should be heated to 212° or 180°, as the case might be, which dissipated the chloroform completely. As to the objection urged against the strength of the official "liquors," if the dispenser did not like to make the calculation involved he could dilute 4 parts to 5 and use that as a 1 to 7 strength. He could bear Mr. Brodie out in his remarks with regard to the better filtration of a liquor prepared by percolation; this was recognised in the second process given in the paper. The deposit in liq. calumbæ conc. was, no doubt, caused by the development of acidity, and it was in order to obviate this that he had recommended the use of chloroform water with the view of preventing incipient fermentation and keeping the percentage of spirit as high as possible by working with clear liquids and on a definite volume.

On the proposition of the CHAIRMAN, unanimous votes of thanks were passed to Mr. Bird, and to Messrs. Farr and Wright for their papers.

The next paper was on:—

TWO YEARS' ANALYTICAL EXPERIENCE OF THE POOR LAW DRUG SUPPLY (IRELAND).

BY CHARLES R. TICHBORNE, F.I.C., DIP.P.H., R.C.S.I.,

Prof. of Chemistry, Pharmaceutical Society of Ireland; County Analyst, Longford, etc., etc.

I have been asked to read a paper at this Conference, and after some consideration I have decided upon the above subject. It is one of general interest, it presents a few phases of absolute novelty, and it will, I think, be rather an agreeable surprise to many of our English friends to find that, take it all in all, the Poor Law Drug Supply in this country is really a fairly good one. During the two years 834 samples of drugs were examined in my laboratory, which had been selected by the medical officers from time to time. It will perhaps be necessary to explain the regulations under which these samples are taken. Part of the payment for the medical supplies is found by the Local Government Board,

but only on certain conditions, one of which is that the medical officers in charge should select at least half a dozen of the drugs out of each half-year's supplies for analyses. These samples are forwarded by the Clerk of the Union to the Analyst appointed for the district, such analyst having been sanctioned by the Local Government Board. Copies of the analyst's certificate must be sent in each case to the Local Government Board, the Medical Officer, and Board of Guardians. If the supply of a particular article is not up to the mark, it may be ordered to be replaced at the contractor's expense ; but serious, or wilful, adulteration may perhaps ultimately result in the Local Government Board refusing to sanction the appointment of such a contractor any further. It will thus be seen that at least twelve samples per annum from each dispensary must be selected from time to time.

Of the 834 samples submitted to me during the two years, 120 have been reported against, making the percentage of defective articles 14 per cent. But 17 of these, equal to 2 per cent., were perishable articles, such as spt. ether. nit., lin. camph. co., emp. menthol, or spirit. ammoniæ aromat. Of course there are cases where, even in these articles, a clean certificate could not be given, as they were evidently intentional adulterations. What I mean by a perishable article is one that will not keep at a standard strength, although ordinary care may be taken to store it in a suitable vessel and place. The errors of careless making—*i.e.*, a slight difference in such preparations as dilute hydrochloric acid —constitute another 1 per cent., so that, deducting 3 per cent. for perishable articles and careless manufacture, it brings down the sophisticated articles to 11 per cent.

In the two years' experience there were some curious observations made, and the following instances may be cited as special or uncommon adulterations :—

Boric Acid is generally a fairly pure chemical, and of ten samples examined by me only one was adulterated, and it contained gypsum in considerable quantities.

Bismuth Salicylate.—In no case could I find a sample of this salt which would stand the B.P. test for free salicylic acid. ("Alcohol 90 per cent. with which bismuth salicylate has been shaken should not give a violet colour with the test solution of ferric chloride.")

On one occasion I wrote to a celebrated maker of salicylates, asking him if he could supply a salt which would represent the British Pharmacopœia preparation. He said he could, but I am

compelled to confess that his specimen, when sent to me, turned out no better than those previously under observation, and I have no doubt that the test must be expunged from the next Pharmacopœia, or modified. I never certify against a sample of bismuth salicylate because it will not obey this test as laid down. At one time a considerable number of salicylates of bismuth were in the market which were mixtures of carbonates of bismuth and salicylic acid, mechanically mixed in molecular proportions. Such preparations are easily determined by the alcohol test, as it separates the free acid and gives very intense reactions. When submitted to the B.P. test made with alcohol redistilled from alkali, even this pure alcohol will dissociate a trace of the acidulous radical. As regards this test, the wording is too stringent in its bearing.

Emp. Menthol.—I have found it necessary to report against the few samples which I have received of this plaster. They were sent out exactly as ordinary spread diachylon plaster would be, and looked, owing to the structure on which they were spread, exactly like that plaster in every respect, and like it also, they were devoid of any suspicion of menthol. Why should there be any? Here we have a volatile compound, menthol, which I find from experience loses about 0·3 per cent. of its weight daily if exposed to the air at ordinary temperatures, and just a thin layer, dissolved in resin, etc., is spread, which may be compared to a skin of varnish, and the manufacturer imagines it will retain its menthol. I find the calico is generally faced with French chalk and barium sulphate, but I would not quarrel with this if the manufacturer would but give "menthol plaster" with some menthol in it. This can be easily done. It is only necessary to spread at as low a temperature as possible and to place the rolled plaster into tin cases which are fairly tight, and it keeps extremely well. A few crystals of menthol inserted into the case will make the process of preserving it about perfect, because the air in the case when saturated with menthol, will not take up that contained in the plaster. The menthol plaster is a most valuable local stimulating adjunct to our remedial resources, as it possesses properties which render it an improvement on mustard in many respects but if served up to the medical profession in the present form it will soon pass into disrepute.

Ext. Cascaræ Sagradæ Liq.—I cannot report favourably of this extract as found in commerce. Out of twenty-nine samples examined I found nine not only inferior but evidently adulterated. We may call this 31 per cent. I presume this large percentage

of inferior specimens is owing in a great measure to the fact that it is an article extensively in demand by the public outside its use in the legitimate practice of medicine. When articles become opened up to commercial competition the quality of the average specimens invariably goes down. I find that this extract, if made according to the B.P., should yield about 24 or 25 Gm. to the 100 c.c. of fluid extract. I believe this question has been disputed. Now, there is one simple characteristic of this extract that may be taken as a test—it is that it is not hygroscopic. A few drops left on a glass slide to dry at ordinary temperatures will become in a few hours a bright varnish-like layer without the slightest "tackiness." In some of these extracts glycerin was used either wholly or partially in place of spirit. Of course, the glycerin extracts will not dry at all and remain fluid. But we find there are other cases which do dry but still give a more or less decided "tacky" feel when dry. Now, on further examination, these will generally be found to give a much more marked reduction with Fehling's solution than that obtained with the genuine extract, and by comparing this relatively reducing action with the total extract present a fair idea may be obtained of the amount of sugar colouring which has been used in that particular sample to bring it up to the colour of ext. cascaræ B.P. I find the ratio of reduction is about 0·37 to each per cent. of extract present. In the course of my investigations on this preparation, I procured a number of samples of the bark from reliable sources and determined the amount of extractive matter which they yielded to cold water infusions. I give the following as typical results:—

Sample	A	yielded	33·6	per cent. of extractive.	
„	B	„	29·9	„	„
„	C	„	32·4	„	„
„	D	„	34·2	„	„

It is quite evident that as 1,000 Gm. of the bark are taken to prepare 1,000 c.c. of B.P. extract. cascaræ sagradæ liq., my standard of 24 or 25 Gm. of extractive to the 100 c.c. is not a severe one.

With regard to the reducing action of the extractive upon Fehling's solution, I found it to be equivalent to from 35 per cent. to 40 per cent. of glucose in all the dry extracts that I made myself; but in a sample sent to me for analysis (and condemned) I found it to have a reducing action equal to 52 per cent. of glucose in the dry extract!

Liniments of Aconite, Belladonna, etc.—At first the use of methylated spirit was not sanctioned by the Local Government Board, and for some little time it seemed to escape notice that the contractors were supplying methylated liniments. I first drew attention to this fact. There were two or three reasons for it escaping observation. The doctors did not send up many samples owing to their being external remedies. Again, the idea that methylated liniments can always be determined by the smell is a fallacy, owing to the extraordinary covering power of the camphor; but, besides all this, the process for the positive determination of methyl alcohol, namely, a modification of Riche and Bardy's test, is very long, expensive and troublesome, and a ready method is still required; but up to this period I am not aware of any other. A similar process is used by the authorities of Somerset House, and it is a subject upon which they are well advised. The use of methylated liniments was sanctioned by the Local Government Board at the commencement of the year; and the Army Medical Board allows their use, so that it does not now, from a monetary point of view, come under our consideration. But the whole business raises a curious question: Methylated liniments are not sanctioned by the British Pharmacopœia, but I find from actual observation that the use of methylated liniments by compounders in making up doctors' prescriptions is very general. Only a few of the higher class pharmaciens use B.P. liniments, but they are unquestionably the exceptions. I will pass no comment upon the question, Is a methylated liniment objectionable from a medical standpoint or from the point of view of elegant pharmacy? But I do say this, that if the methylated liniments are to be used in prescription compounding, they should be recognized in the Pharmacopœia. If it is in regular form for a compounder to dispense a liniment similar to the B.P., but made with a disagreeable wood naphtha, it would be equally good form for him to dispense a lin. camphoræ made with a mineral oil; yet such cases in England have been treated (and properly so) as adulterations of a very objectionable character.

Sulphur Sublimatum.—It is curious to observe that the B.P. article is rarely supplied as regards this remarkably cheap drug. I believe this is a question more of ignorance than intention. It is directed to be free from acid, but it is hardly ever free from this objectionable acidity. What is specified in the B.P. is the old washed sulphur. There should be no difficulty about it, as such washing only adds about 6*d.* a cwt. to the cost of its

production. The last sample I examined contained nearly 1 per cent. of free sulphuric acid.

Pearl-Coated Pills.—I have a few words to say upon the subject of these bullet-like bodies. They appear to me to consist of four or five grains of medicaments, well dried or baked, and then coated by a hard shell of talc or other insoluble mineral substance, which is then rendered perfectly impervious to the action of moisture by paraffin. If a few of these pills be first pricked with a needle and then placed in a wine-glass of cold water and allowed to remain some time, it will be observed that the coating never dissolves, but after a little of the moisture diffuses into the pill, it so swells the pill proper that the shell bursts. You remember the old experiment of bursting the cannon ball by freezing the water. These pearl-coated pills have been brought into fashion by their portability and nice appearance. Their use is a retrograde move in pharmacy, and should never be sanctioned by the physicians. Their general structure and character is well known; but there is a much more important phase of this question: If the physician allows his prescriptions to be compounded with these pills, he should be certain that they are at least made by the best makers. They offer extraordinary facilities for the use of inferior drugs. I am also of opinion that when makers find it necessary to make changes in the formula of the B.P., they should state so on their lists or labels. Some of these changes are introduced because the mass, as made according to orthodox formula, would penetrate through the shell of the pill, impervious though it might be to the juices of the stomach. Thus, castor oil is nearly always left out of the pil. calomel co. Such a pill, from which you have removed the shell, if placed in water will disintegrate in a few hours and fall as a powder to the bottom of the vessel. The real pill mass will not do so after any lapse of time. Again, the substitution of menthol for oil of peppermint in the pil. rhei co. is not of much importance, but, like many other tricks of the trade, should be noted. In prescribing pills the physician should specify what character of coating he requires—i.e., silver, sugar-coated, or gelatin; otherwise, he may be assured that, owing to their cheapness, pearl-coated pills will be supplied.

Pulv. Jalapæ Comp.—A curious observation was made of the substitution of powdered jalap for the above preparation. This represents a type of adulteration distinct from most of the others.

Tr. Rhei Co.—The glycerin is sometimes left out of this tincture; why, I can hardly conceive, except where in a few cases the spirit was also left deficient in a sufficient amount to represent the average specific gravity of this tincture—viz., 0·972.

It is only fair in a paper of this character that a few words should be said on the side of the contractor. The statistics show that the amount of actual adulteration is very low, and occasionally he is injured by an erroneous opinion given by the analyst. I do not think this often happens; but my experience is that whatever the analyst says, it is sure to be contradicted by the contractor. I do not think myself this is wise on the part of the latter. It weakens his case even when he has a good one. The better the analyst the more readily he will acknowledge a mistake. The better the supplier the more readily he should acknowledge an inferior supply and put it right. There have been mistakes made to my own knowledge against the contractor; I am not, of course, speaking of my own laboratory. Pepsines and liquor pepsines have been condemned (when tested by the Pharmacopœia test) which were quite right. This is owing to the difficulty of keeping a water bath at a constant temperature for six hours, particularly in a busy laboratory. If the bath once reaches 120° F., even for a short time, the digestive action of the pepsine is at once destroyed. I always use an incubator similar to the one I use for bacteriological work, and tune it to give a temperature of 100° F. A low temperature, such as 60° or 70°, will do the work of digestion if it lies long enough; but a high temperature destroys it. Again, I have seen perfectly pure butylchloral hydrate condemned owing, I believe, to the meagre description of the test as given in the Pharmacopœia. It says that "it does not yield chloroform when heated with potassium hydroxide or milk of lime" (absence of chloral hydrates). It is true that it does not yield chloroform, but it throws down a substance exactly like it in appearance (allylene dichloride), and the inexperienced analyst jumps at the conclusion that he has got chloroform. The reaction should be further described by directing this chloroform-like substance to be heated with acetanilidum, when the peculiar smell of phenyl-isonitrile is produced if it contains the impurity.

In conclusion, I am strongly of opinion that in connection with the Local Government arrangement the contractor should have an appeal to Somerset House, he being heavily fined if he has given unnecessary trouble. I offer no excuse for referring so often to the British Pharmacopœia tests. I hope the time has

passed away when it could be pleaded in a court of law that the Pharmacopœia is not to be accepted as the legal standard on all drugs. Whatever may be the merits of this question, it is the law, *vide Pharmaceutical Journal*; but, besides this, the practice in the courts is daily establishing its acceptance. The Local Government say so. The Army, as regards its supplies, say so, and the Law Courts follow suit. I wish the hospitals in this country would do likewise. What good is the best physician in the world if his prescribing is not followed out? The hospitals have lately imitated the Local Government Board in one respect: they say you must buy the cheapest medicine you can get, but here they stop. The Local Government Board says the same, but it says there must also be compulsory analysis of each and every supply. The hospitals take the cheap drugs without the control.

The PRESIDENT said pharmacists were always willing to welcome criticisms on their actions, but he would point out that the shortcomings to which Professor Tichborne had referred hardly came under the heading of pharmaceutical errors. They were probably made on drugs contracted for at the lowest possible price by the Poor Law Union, and did not represent the drugs in ordinary use. As chairman of a large sanitary authority he had been struck with the excellent quality of the drugs supplied by some who, though not pharmacists, practised pharmacy. There was no doubt that, on the whole, owing mainly to the efforts of the Pharmaceutical Societies and the Conference, the quality of drugs supplied had greatly improved during the last few years.

Mr. BRUNKER confirmed what Professor Tichborne had said as to the improved qualitity of drugs supplied to Unions, and said it was only fair to contractors in Ireland, who had been for years under a cloud, that this should be stated. His experience was not so long as Professor Tichborne's, but out of 2,400 analyses which had come under his observation, the number objected to was only 3½ per cent., and they included sweet spirit of nitre and similar articles. With regard to cascara sagrada, he (Professor Tichborne) had adopted rather a high standard, for if 25 per cent. were adopted as the minimum of extract, 75 per cent. of the samples submitted would have been objected to. The samples of pepsin had not recently been rejected in the way Professor Tichborne mentioned.

Mr. PAYNE (Belfast) wished to make a remark with reference to the President's statement that drugs were contracted for at the

lowest possible prices by the Poor Law Unions. Though not a Poor Law Guardian he was closely connected with one, and he might say that matters had materially changed within the last thirty years. Formerly it was the custom to send to Ireland inferior drugs, but since Irish pharmacists had begun to assert themselves by requiring wholesale houses to send only the best quality of drugs to this country things had changed, and, as Professor Tichborne had said, the adulteration of drugs was comparatively rare. He found on inquiry that the analyst of the Union with which he was connected, the largest in Ireland, with the exception of North and South Dublin, had rarely to report a case of adulteration.

Mr. T. Tyrer said he could not deal with the general question raised in this paper, but he was much struck with one or two points. With regard to bismuth salicylate, he was glad to learn that the mixture, which undoubtedly was once very frequent, had now ceased. He made no excuse for a mixture, but until the rather peculiar properties and action of salicylic acid was fully understood it was difficult to make a perfectly stable and uniform bismuth salicylate.

With regard to the test for methyl referred to—and with which he had had much to do—some time ago he was favoured with the official modification, which was not very serious, but quite enough to determine the value of the test. He had tried every modification which had been suggested with regard to this very important test, and he could only say that it was most unsatisfactory unless the most rigid conditions were carefully complied with. It was one of the worst tests he knew for developments of an unexpected character, and he was in a position to say that undoubtedly pure spirit had been condemned by it. It depended on the minute conditions which were difficult to describe, and the test extended over fifty hours. He had been experimenting for years on this question, and had indications of the direction in which a satisfactory test might be found. Possibly next year a paper on the subject might be forthcoming.

He was surprised that Professor Tichborne did not recommend the use of a thermostat for the regulation of temperature where it was of importance.

Mr. Bird remarked that the extractive matter in a perfectly genuine preparation of liq. cascaræ sagradæ might fall as low as 22 per cent., or even lower. Would Professor Tichborne condemn such a sample as being "deficient," or in other words "not

prepared according to the Pharmacopœia"? This question of the limits of variation in the physical character of galenical preparations was very important, and he suggested that it might usefully occupy the attention of the members of the Conference next year.

Mr. GADD said the percentage commonly ranged from 20 to 27.

Professor PRESCOTT, U.S.A., said that in the July number of the *Pharmaceutical Review* of the United States would be found some observations and recommendations on the subject of methyl-alcohol and ethyl-alcohol processes, made by an Investigation Committee of the United States Pharmaceutical Association, and on the same subject the results of some experiments were given within the last year in the *American Chemical Journal.* This depends upon reduction by copper oxide and detecting the formaldehyde resulting in the usual way, acetaldehyde being destroyed with hydrogen peroxide, 3 per cent. of wood spirit can thus be detected.

Dr. SYMES said Dr. Tichborne had mentioned with regard to the temperature of digestion with the pepsin that at 120° the pepsin was destroyed, but some years ago this matter came before the Conference, and it was then shown that if the temperature reached 125°, the digestion was still more rapid than even at a lower temperature.

Mr. MARTIN said he hoped when any one from England brought a prescription over to Dublin to be dispensed that such a thing as methylated liniment would not be supplied unless ordered, and the same with regard to the pearl-coated pill.

Sir THOS. ROBINSON said the subject was a most interesting one to Irish chemists. The conditions under which drugs had been supplied to Poor Law Unions in the past had been most unsatisfactory. The statement that within the last six months great improvements had taken place was more to their discredit than anything else. Formerly the supply of drugs to the Poor-law Unions was a matter of contract. A list of 600 items was handed to the contractor, who filled up the list at all sorts of ridiculous prices, in the hope that the Board of Guardians would total the lot up, and give the contract to the lowest tendered. The result of this was that drugs of the most extraordinary character were supplied for the poor. It was only within the last few years that the Local Government Board took the matter in hand, and decided that it was a disgrace to the country. A list of wholesale prices was obtained from some of the leading houses, and then tenders asked for on those prices, and manufacturers were asked what discount they would allow, and in some cases tenders were given as

much as 50 per cent. below those prices. The medical officers became very excited over this, and watched the matter closely Samples were sent to them which were thoroughly unsatisfactory and unreliable. He did not know how the different oils were "fixed up," nor did he know how the tinctures "lived" till they got to their destination, they were so short of spirit. He thought the supreme audacity of the moment was reached when a contractor, having contracted to supply emplastrum belladonnæ at 1*s.* 6*d.* a yard, sent in plaster fit only for strapping, and when remonstrated with said no specific width was stipulated. All this was not pleasant for him to have to tell, but it might be taken as one of the reasons why pharmacy in Ireland was not in the position in which it was in England. He was glad to say that the reports were now eminently satisfactory, and that the manufacturers and traders were supplying what they ought to have supplied at first. In the most recent tenders it was interesting to note that discounts of 2 per cent., 3 per cent., and 5 per cent. only were offered now as against 50 per cent. of twelve months ago.

Professor TICHBORNE in reply, said he did not think he had been very hard on the character of the drugs supplied, though he could not agree with Mr. Brunker that 3½ per cent. would represent the proportion of defective samples, and was, in fact, rather astonished to find it so low as 11. The great safeguard, of course, was analysis. He could not and would not say anything about the character of the drug supply years ago, but it stood to reason that where there was no check and there was keen competition the supply would not be as good as it ought to be. That was the point of his remarks, and his great desire was that hospitals should follow the same course, and, after obtaining the best possible medical skill, in the next place take means to secure good drugs. With regard to cascara, he had not adopted any arbitrary standard, but had simply taken the average result obtained, and he was borne out by Mr. Gadd. With regard to the test for methyl alcohol, he could sympathise with his manufacturing friends as to the unsatisfactory character of the test, but, unfortunately, it was the best they had. The Excise authorities had, of course, paid every attention to this matter, which was of the utmost importance to them, and were aware of the imperfection of this test, but there was no better. Professor Reynolds, of Dublin, had devised a test which gave a very beautiful reaction, but on going into it it was found that several other subtances gave the same reaction. In fact, it was a test for acetone, and was not decisive of the presence of

methyl. He did not go so far as Mr. Tyrer as to the uncertainty of the official test, because, although pure spirit would sometimes give the reaction, there was a great difference between the pale rose colour thus produced and the intense purple colour given by methylated spirit. In such a case a comparative experiment should always be made with a known pure spirit, and the sample under examination should not be condemned unless a markedly different result was obtained. He might mention that there were some little practical details which were of assistance. For instance, he found it useful to greatly dilute the coloured spirit, and to use a little chlorinated lime, which had a much greater bleaching effect on pure spirit than on methylated. With regard to the temperature at which the activity of pepsin was destroyed, he did not profess to give the exact figure, but rather to call attention to the importance of paying attention to this question.

The PRESIDENT, in proposing a vote of thanks to Professor Tichborne, remarked on the advantages arising from pharmacists and public analysts coming into contact, by means of which any question which arose between them might be disposed of. He need hardly say that pharmacists knew nothing of the use of methylated spirit in medicine.

In the absence of the authors, Mr. NAYLOR gave a summary of the following paper :—

NOTE ON THE CAUSES OF THE LOSS IN STRENGTH OF SWEET SPIRIT OF NITRE.

BY E. H. FARR, F.C.S., AND R. WRIGHT, F.C.S.,

Pharmaceutical Chemists.

The immediate object of the experiments detailed in this note was to ascertain the correctness or otherwise of two ideas which one or the other of us entertained. The first was that spiritus ætheris nitrici, Ph. Lond., was more stable than the stronger preparation of the British Pharmacopœia. The second and more important was, that the remarkable loss in strength exhibited by certain samples of sweet spirit of nitre which had come under our notice could not be satisfactorily accounted for by any theory of chemical change of which we were cognisant. The observation that this sudden drop in the percentage of ethyl nitrite was always

most noticeable when the spirit was introduced into a bottle capable of holding a much larger quantity, so that a considerable air-space was left above the level of the liquid, pointed strongly to the fact that the deterioration in strength was due, not to chemical decomposition, but to the rapid elimination of ethyl nitrite from the spirit, and its diffusion into the air in contact with the surface of the liquid.

For the purpose of our experiments two samples of the spirit were prepared by one of us on January 16, 1901, by the processes of the London and British Pharmacopœias. The processes were slightly modified in order to obtain the greatest possible yield of ethyl nitrite. The products were diluted with 90 per cent. alcohol, and gave preparations 5 c.c. of which yielded 21 c.c. and 35 c.c. gas respectively.

In order to test the effects of keeping under varying conditions, a sample of each was disposed of in the following manner:—

(1) A well-stoppered one ounce white glass bottle was filled and placed in a cool, dark cellar.

(2) Two fluid ounces were introduced into a well-stoppered green flint glass bottle of four ounces capacity, and placed in a window facing east.

(3) Eight fluid ounces were introduced into a well-stoppered green flint glass bottle of twenty fluid ounces capacity, and placed on a shelf about five feet above an open fire-place, in which a fire was burning daily. The stopper was taken out every morning, and the bottle tilted as in the act of pouring.

(4) Eight fluid ounces were introduced into a well-stoppered green flint glass bottle of forty fluid ounces capacity, and placed on the top shelf of the pharmacy near a window facing north. The stopper was removed daily, and the bottle tilted as in the act of pouring.

(5) Two fluid ounces of spiritus ætheris nitrosi, B.P., were put into a stoppered green flint Corbyn quart, capacity fifty fluid ounces, and allowed to remain at rest in the pharmacy, a little being abstracted from time to time for measurement of the gas.

(6) Two fluid ounces of spiritus ætheris nitrosi, B.P., were introduced into a stoppered Winchester, capacity one hundred fluid ounces, and allowed to remain at rest in the pharmacy, a little being abstracted from time to time for measurement of the gas.

The different samples were tested more or less frequently by the official process, the results being subjoined.

(1) One-ounce bottles filled and placed in a cool, dark cellar:—

Date.	Sp. Ætheris Nitrici, Ph. Lond.	Spiritus Ætheris Nitrosi, B.P.
1901.		
January 17 .	5 c.c. = 21 c.c. gas	5 c.c. = 35 c.c. gas
May 6 . .	5 c.c. = 19·8 c.c. gas	5 c.c. = 32·4 c.c. gas
July 25 . .	5 c.c. = 19·2 c.c. gas	5 c.c. = 31·0 c.c. gas

(2) Four-ounce bottles half filled and placed in window:—

Date.	Sp. Ætheris Nitrici, Ph. Lond.	Spiritus Ætheris Nitrosi, B.P.
1901.		
January 17 .	5 c.c. = 21 c.c. gas	5 c.c. = 35 c.c. gas
February 20 .	5 c.c. = 13·6 c.c. gas	5 c.c. = 25·2 c.c. gas
May 1 . .	5 c.c. = 0·7 c.c. gas	5 c.c. = 1·0 c.c. gas

(3) Eight fluid ounces in pint bottle stood on shelf above fireplace, opened and tilted daily and tested fortnightly:—

Date—1901.	Sp. Ætheris Nitrici, Ph. Lond.	Spiritus Ætheris Nitrosi, B.P.
January 17 .	5 c.c. = 21·0 c.c. gas	5 c.c. = 35·0 c.c. gas
February 4 .	5 c.c. = 17·8 c.c. gas	5 c.c. = 26·8 c.c. gas
February 15 .	5 c.c. = 16·6 c.c. gas	5 c.c. = 28·2 c.c. gas
March 4 .	5 c.c. = 15·4 c.c. gas	5 c.c. = 26·6 c.c. gas
March 18 .	5 c.c. = 15·0 c.c. gas	5 c.c. = 25·2 c.c. gas

The bottles were now left undisturbed, and then tested monthly. Result:—

April 30 .	5 c.c. = 14·0 c.c. gas	5 c.c. = 23·8 c.c. gas
May 30 . .	5 c.c. = 13·8 c.c. gas	5 c.c. = 22·0 c.c. gas
July 1 . .	5 c.c. = 13·2 c.c. gas	5 c.c. = 20·0 c.c. gas
July 25 . .	5 c.c. = 12·0 c.c. gas	5 c.c. = 19·7 c.c. gas

These results show at first a sudden drop in the percentage of ethyl nitrite indicated, followed by a gradual slight diminution in strength subsequently.

(4) Quart bottles containing eight fluid ounces opened and tilted daily :—

1901.	Sp. Ætheris Nitrici, Ph. Lond.	Spiritus Ætheris Nitrosi, P.P.
January 17 .	5 c.c. = 21·0 c.c. gas	5 c.c. = 35·0 c.c. gas
February 4 .	5 c.c. = 16·6 c.c. gas	5 c.c. = 27·6 c.c. gas
February 16 .	5 c.c. = 15·8 c.c. gas	5 c.c. = 25·6 c.c. gas
March 4 .	5 c.c. = 14·8 c.c. gas	5 c.c. = 24·0 c.c. gas
March 18 .	5 c.c. = 14·2 c.c. gas	5 c.c. = 22·8 c.c. gas

The bottles were now left undisturbed and tested less frequently :—

April 30 .	5 c.c. = 12·9 c.c. gas	5 c.c. = 20·4 c.c. gas
May 30 . .	5 c.c. = 12·6 c.c. gas	5 c.c. = 19·8 c.c. gas
July 1 . .	5 c.c. = 11·8 c.c. gas	5 c.c. = 19.0 c.c. gas
July 25 . .	5 c.c. = 11·6 c.c. gas	5 c.c. = 18·4 c.c. gas

These figures corroborate those shown by the samples contained in pint bottles. The initial loss is here greater, the average subsequent loss exactly the same. The latter is probably due to diffusion into the air admitted when the portions for testing are taken out.

(5) Two fluid ounces Spiritus Ætheris Nitrosi, B.P., in 50 oz. Corbyn quart :—

On February 16, 1901 . 5 c.c. yielded 33·6 c.c. gas.
„ February 18, 1901 . 5 c.c. yielded 23·8 c.c. gas.
„ February 20, 1901 . 5 c.c. yielded 20·4 c.c. gas.
„ February 23, 1901 . 5 c.c. yielded 18·8 c.c. gas.
„ March 4, 1901 . . 5 c.c. yielded 16·0 c.c. gas.
„ March 13, 1901 . . 5 c.c. yielded 12·7 c.c. gas.
„ March 27, 1901 . . 5 c.c. yielded 8·0 c.c. gas.
„ April 30, 1901 . . 5 c.c. yielded 0·8 c.c. gas.

(6) Two fluid ounces Spiritus Ætheris Nitrosi B.P. in 100 oz. Winchester :—

On February 16, 1901 (8 p.m.) . 5 c.c. gave 33·6 c.c. gas.
„ February 18, 1901 (10 a.m.) . 5 c.c. gave 20·6 c.c. gas.
„ February 20, 1901 (10 a.m.) . 5 c.c. gave 18·8 c.c. gas.
„ February 23, 1901 (3 p.m.) . 5 c.c. gave 16·8 c.c. gas.
„ March 4, 1901 (9 a.m.) . . 5 c.c. gave 13·6 c.c. gas.
„ March 13, 1901 (9 a.m.) . 5 c.c. gave 10·0 c.c. gas.
„ March 27, 1901 (9 a.m.) . 5 c.c. gave 5·0 c.c. gas.
„ April 30, 1901 . . . 5 c.c. gave nil c.c. gas.

These results are conclusive as to the extreme rapidity with which the official preparation will part with the whole of its active constituent even under ordinary conditions of storage. The other conditions were made as extreme as possible in order to lend additional emphasis to the result.

Harvey (*Chemist and Druggist*, May 25, 1901, p. 834) has shown that when a small quantity of solution of ethyl nitrite is put into a bottle and well shaken it loses in some cases 80 per cent. of its strength with startling rapidity. We have found, however, that this loss in the case of the official spirit does not go on indefinitely. The very slight progressive diminution in strength shown by some of the samples kept under observation led us to the conclusion that, except when exposed to direct sunlight, very slight loss takes place after the superincumbent air has become saturated with the vapour, until fresh air is admitted into the bottle. Thus, some stock spirit was tested on December 3, 1900, and standardised to yield seven times its volume of gas. On May 17 this was tested, the bottle being one-third full. Five cubic centimetres yielded 17·6 c.c. gas. After being well shaken for five minutes 5 c.c. yielded 17·8 c.c. gas. Another sample tested in the same way gave 13 c.c. gas before agitation and 12·6 c.c. afterwards.

Harvey, in the note to which reference has already been made, has stated that the destructive action of direct sunlight upon the spirit may be prevented by keeping it in amber-coloured glass bottles, as indicated in the United States Pharmacopœia. In order to test the correctness of this statement some freshly-prepared official spirit was exposed in a window facing east and south from June 15 to July 9. It was apportioned as follows: (1) An amber-coloured glass-stoppered bottle, capacity three fluid ounces, *full;* (2) an amber-coloured glass-stoppered bottle, capacity three fluid ounces, *half full;* (3) a white glass-stoppered bottle, capacity two fluid ounces, *full.* Tested on June 15, 5 c.c. of the spirit yielded 36·4 c.c. gas. On July 9, 5 c.c. No. 1 yielded 36·2 c.c. gas; 5 c.c. No. 2 yielded 31·4 c.c. gas; and 5 c.c. No. 3 yielded 14·2 c.c. gas.

Side by side with the above and on the same date a second series of samples was placed just under a skylight through which on bright days sunlight was streaming for six or eight hours. The samples were placed just out of reach of the sun's rays, on a shelf inside the south wall.

Tested on July 9 these samples gave the following results:—5 c.c. No. 1 yielded 36·1 c.c. gas; 5 c.c. No. 2 yielded 30·6 c.c. gas; 5 c.c. No. 3 yielded 34·0 c.c. gas.

The inference to be drawn from these results is that diffused light, however bright, has no chemical action on the spirit, but that exposure to direct sunlight is fatal. The observation by Harvey that amber-coloured glass affords perfect protection to the spirit in all circumstances is confirmed. There is a loss in the case of No. 2 sample in each series, owing to diffusion, the bottles being only half-filled.

The PRESIDENT said the writers of this paper were to be thanked for the assiduity with which they had carried out a large number of experiments, and for the practical suggestions contained in their paper.

Dr. ATTFIELD said the fact that the loss was caused by diffusion had been called attention to on several occasions, even prior to the time of Harvey. This would impress upon pharmacists the necessity for keeping their stock in vessels which once opened would soon be emptied, or even in small vessels ready for sale, all the vessels being kept air tight by sound corks or finely ground and perhaps lubricated stoppers.

Mr. RUTHERFORD HILL said the stoppering of the bottles was an important point, and frequently accounted for loss of strength. Glycerin had been suggested as a good preservative and owed its value to acting as a lubricant for the stoppers.

A vote of thanks was passed to the writers of the paper.

The next paper was on

THE PRESENCE OF ARSENIC IN FERRUM REDACTUM AND ITS APPROXIMATE DETERMINATION.

By E. SAVILLE PECK, M.A.

In a paper read before the Conference in 1898 I drew attention to the fact that many samples of ferrum redactum contained traces of arsenic, and suggested that "there should be a limit to the amount of arsenic present."

In his *Digest of Researches and Criticisms*, 1900, the Editor of the Pharmacopœia notices this, and suggests that I "should adopt, tentatively, the official arsenium limit laid down under glycerinum."

Various experiments were performed to this end, but the frequent occurrence of sulphides and the difficulty in a simple appa-

ratus of being assured of the absorption of the whole of the sulphuretted hydrogen evolved, by a solution of lead acetate, before reaching the mercuric chloride, obliged me to consider this method unsatisfactory.

Each of the sixteen samples examined contained sulphide.

In the new German Pharmacopœia, Edition IV., 1900, the limit of arsenic is fixed by its detection with a solution of stannous chloride as follows: "A mixture of 0·2 Gm. of reduced iron and 0·2 Gm. of potassium chlorate must be put into a large test tube and 2 c.c. hydrochloric acid poured over it. After the reaction is ended it must be warmed until the free chlorine is driven off, and the solution thus produced, filtered. 1 c.c. of the filtrate with 3 c.c. of solution of stannous chloride should not take a darker colour in the course of an hour."

It was found that the test solution of stannous chloride of the British Pharmacopœia was of no use for this purpose, so reference was made to the solutio stanni chlorati of the German Pharmacopœia. This is prepared as follows: "Crystallised tin chloride, 5 parts; hydrochloric acid, 1 part; stirred to a paste and then completely saturated with dry hydrochloric acid gas." The solution is then filtered through asbestos, and is described as a pale yellowish, strong-smelling liquid, with a specific gravity of at least 1·900." The two different batches of solution I made had specific gravities of 1·98 and 1·96 respectively. The samples were then treated as directed with this solution.

It was observed that in those samples which gave a coloration precisely the same tint was obtained in each of the three or more experiments upon the particular sample. It then occurred to me that a definite coloration was due to a definite amount of arsenium, and that the darker the coloration the greater the quantity present. To prove the truth of this a series of experiments were made with a trituration of a sample of ferrum redactum previously proved to be free from arsenium, with a known weight of arsenious oxide. Definite quantities of this were taken and treated in the same manner, when a clear gradation of colours was observed, varying in proportion to the amount of arsenious oxide present. By this means it was possible to approximately copy the coloration given by the samples of ferrum redactum containing unknown quantities of arsenium.

A 1 per cent. solution of As_2O_3 in dilute HCl was then taken, and various quantities evaporated on water bath to low bulk and treated with 3 c.c. of the stannous chloride solution. At this

strength the brown coloration was immediately produced, but quickly resolved itself into a heavy dark brown precipitate, with a clear supernatant liquid, showing that the test will not work satisfactorily colorimetrically with a solution of As_2O_3 so strong as 1 per cent. This brown precipitate is stated in Crookes' *Select Methods in Chemical Analysis* to consist of from 95·86 to 98·46 per cent. of metallic arsenic.

He further states that tin chloride does not act upon combinations of antimony under the same conditions.

The 1 per cent. solution of As_2O_3 was diluted to a 0·1 per cent., and finally to a 0·01 per cent. As_2O_3 solution. Of this solution 0·1 c.c., corresponding to 1 part of As_2O_3 in 100,000 parts of water was taken, slightly warmed, and then 3 c.c. of the stannous chloride solution added, a definite coloration took place, showing the great delicacy of the test. Then 0·2, 0·4, 0·6, 0·8, and 1·0 c.c. were taken and treated in the same manner, with the result that an even graduation of colours was found to form in from five to fifteen minutes, and to remain permanent for at least one to three hours.

The coloration assumed varies from a light reddish-brown through dark brown (burnt sienna) to black, according to amount of arsenium present. [A table of colorations was shown at the meeting.]

It was found that 5 c.c. of 0·01 per cent. As_2O_3 solution, when carefully evaporated, gave the same tint as 0·5 c.c. of 0·1 per cent. It thus seems possible to, as it were, Nesslerize dilute solutions of arsenium by means of this concentrated solution of stannous chloride.

Sodium arsenate was taken and kept at a temperature of 145° c.c. for three hours, thus driving off its water of crystallisation and bringing its formula to—

$$Na_2HAsO_4 = 184{\cdot}78.$$

1 Gm. of As being contained in 2·48 Gm. of the salt. A 1 per cent. solution of this was made and diluted to 0·01 per cent. 4 c.c. of this was evaporated to low bulk, and 3 c.c. of the stannous chloride added. The coloration produced was found to approximately correspond with that produced by 2 c.c. of 0·01 per cent. solution of As_2O_3 when treated in the same way.

Now, $As_2O_3 = 196{\cdot}64$, and 1 Gm. of As is contained in 1·319 Gm. of As_2O_3. Therefore, a 0·01 per cent. solution As_2O_3 contains approximately *twice* as much arsenium as a 0·01 per cent. solu-

tion of sodium arsenate; therefore, *theoretically*, 4 c.c. sodium arsenate 0·01 per cent. solution is approximately equivalent to 2·0 c.c. As_2O_3 0·01 per cent. solution, as indicated by the coloration. This fairly shows that the $SnCl_2$ solution makes for the arsenium in both cases, and that alone.

Reverting to the ferrum redactum, it was found that if the coloration obtained by treating the sample according to the directions given before was sufficient to entirely overcome the very slight greenish tint given by the hydrated ferrous chloride, it was necessary only to take certain volumes of a 0·01 per cent. As_2O_3, evaporate to low bulk in a porcelain dish on a water-bath, and add to each 3 c.c. $SnCl_2$ solution, and decide which quantity gave a coloration which corresponded as nearly as possible to the coloration given by 0·1 of the sample of ferrum redactum containing arsenium, and from these data calculate the approximate percentage of arsenium present. The amounts given in the table were calculated in this way.

Sixteen samples were collected from various sources, four being obtained direct from one of the largest makers in Germany. The samples were treated in the manner described, with one important modification, that of making up the solution to 2 c.c. after driving off the chlorine and before filtering. The filtrate 1 c.c., representing 0·1 Gm. of the ferrum redactum, was placed in a small evaporating dish, 3 c.c. of the solutio stanni chlorati added, and the coloration compared with those of the standards. Three or more experiments were made upon each sample, with uniform results.

To see if the coloration was really due to the presence of arsenium, 0·2 Gm. of the sample B was taken and treated in the way described. Another 0·2 Gm. was taken and treated with HCl and heated on water-bath, the AsH_3 being allowed to escape. $KClO_3$ was then added, the solution made up to 2 c.c. with HCl, filtered and 1 c.c. added to 3 c.c. $SnCl_2$ solution, when it was seen that the coloration was greatly lessened.

By referring to the table it will be observed that three samples can be considered arsenic free, ten samples containing only a sufficient quantity to give a very slight coloration, but too small an amount to copy. Two gave a distinct coloration, and were able to be approximately determined. Four gave a reddish-brown coloration corresponding to amounts given and calculated as explained. I consider these four containing approximately over 0·1 per cent. are not suitable for administration. It will

be noticed that the dark grey and black samples are those which appear to contain most arsenic.

I would venture, therefore, to suggest that the limit of arsenical contamination in Ferrum Redactum, P.B., should be fixed on these lines: (1) That 0·2 Gm. be taken and treated as described. (2) That the solution after driving off the chlorine be made up to 2 c.c. with HCl, and then filtered, of which 1 c.c., corresponding to 0·1 of the sample taken, should be treated with 3 c.c. of the $SnCl_2$ (sp. gr. 1·900) solution. (3) That no light brown coloration should take place within one hour (corresponding approximately to 0·1 per cent. of arsenium).

TABLE SHOWING THE PRESENCE OF ARSENIC IN FERRUM REDACTUM.

I. Sample.	II. Colour of Sample.	III. Coloration assumed by 0·2 Gm. treated as explained.	IV. No. of c.c.'s of 0·01 per cent. As_2O_3 solution used.	V. Per cent. of As in Sample, calculated from IV.
A	Light grey	Very slight	not determinable	
B	Greyish black	Brown	2·5	0·189
C	Grey with lustrous particles	Very slight	—	—
D	Grey	Slight	0·2	0·015
E	Grey	Nil	—	—
F	Grey	Very slight	—	—
G	Grey	Very slight	—	—
H	Brownish grey due to oxidation	Very slight	—	—
I	Grey	Slight	—	—
J	Dark grey	Slight	0·3	0·022
K	Black	Brown	3·5	0·265
L	Grey	Very slight	—	—
M	Grey with lustrous particles	Nil	—	—
N	Light grey	Nil	—	—
O	Greyish black	Deep brown	5·0	0·379
P	Black	Light Brown	2·0	0·151

Mr. BIRD said he had had considerable practice in the examination of pharmaceutical preparations, including ferrum redactum, for arsenic, and could therefore appreciate the very ingenious nature of the test which Mr. Peck had devised. He understood that the limit proposed was 1/10 per cent. He had examined samples of both foreign and English manufacture, the former containing the

quantity before stated, and the English very much less. He (Mr. Bird) would suggest that perhaps 1/100 per cent. would be sufficient, and it was not difficult to get ferrum redactum containing only that small proportion. He had heard that Marsh's test was the most reliable test for arsenic. He quite agreed that that was so from the analyst's point of view, but he thought that as a general method for pharmaceutical purposes Gutzeit's test with the two identification reactions with hydrochloric acid and stannous chloride which he (Mr. Bird) had recently described, was by far the simpler and more convenient; in its modified form the method was now perfectly reliable. But for ferrum redactum, and perhaps in similar cases, the direct stannous chloride colorimetric method, so thoroughly worked out by Mr. Peck, apparently left nothing to be desired.

Dr. ATTFIELD was glad to find that Mr. Peck had acted on the hint he had given him of devising some method of obtaining a limit to the amount of arsenium in ferrum redactum. It was for them as pharmacists to take their stand on the ground that arsenium should not be absolutely absent from certain drugs liable to contain it, for that position might be untenable, but that there should be a limit, that limit being as minute and insignificant as possible. He gathered that Mr. Peck preferred the perchloride method of determination to the copper sulphate method. He quoted a letter which he had received from Mr. Ince on the question whether the substance should be called "redactum" or "reductum," in which the writer said either was correct. He had also received a letter from Dr. Payne to the same effect, this latter gentleman going further than Mr. Ince, and showing that the word "redactum" was more usually employed in chemical or pharmaceutical books written in Latin, whereas "reductum" was a word in much more modern use.

Mr. UMNEY thought the limit of 1 in 1,000 for arsenic suggested by Mr. Peck was little higher than was necessary.

Mr. BIRD: Five grains of ferrum redactum would contain with the $\frac{1}{1000}$ limit $\frac{1}{200}$ gr. arsenic.

Dr. ATTFIELD suggested 0·05 per cent.

Mr. PECK was quite willing to fall in with the suggestion, but he expected that the final court of appeal would be the General Medical Council.

Dr. ATTFIELD said that body would be advised by pharmacists like Mr. Peck.

Mr. PECK said of the four samples of German manufacture two gave no coloration at all; one being labelled German Pharmacopœia, the other British Pharmacopœia. The third gave a deep

brown coloration, and contained approximately 0·379 per cent., while the fourth was a black sample which gave a light-brown coloration, and contained approximately 0·159. With regard to the determination of ferrum redactum, he saw no reason to alter his decision to adopt the mercuric chloride method rather than the copper sulphate.

A vote of thanks was unanimously accorded to Mr. Peck for his paper.

The next two papers were read by Dr. Power.

A SOLUBLE MANGANESE CITRATE AND SOME COMPOUNDS OF MANGANESE WITH IRON.

By Frederick B. Power, Ph.D.

It is worthy of note that neither the British nor the German Pharmacopœia, in their latest editions, has adopted any salt of manganese or preparation made therefrom; the United States Pharmacopœia recognises only manganese dioxide and manganese sulphate, whilst the French Codex, in addition to these, includes also the carbonate.

Although considerable diversity of opinion has existed, and apparently still exists, respecting the therapeutic value of manganese compounds, their wide distribution in organic nature, and their occurrence, together with iron, in the human body, in the blood and bile, would appear to render it probable that they play some part, however subordinate, in the vital processes of both animals and plants.

There can also be little doubt that the value of manganese compounds as medicinal agents depends to a considerable extent upon the form in which the element is administered. Manganese dioxide, for example, is still occasionally prescribed, notwithstanding its frequent impurity, its complete insolubility in water, and its very sparing solubility in dilute acids. With regard to the various salts of manganese at present known, several of which have been recommended from time to time for medicinal use, those which contain the element in organic combination appear to have been most favoured and to have become most largely employed. It furthermore seems probable that even among the organic salts those which are most freely soluble in water, and therefore most readily assimilated, will be found more effective than the less soluble ones.

These considerations have led to some experiments resulting in the preparation of such a soluble organic salt of manganese and some compounds with iron, the description of which is given in the present paper.

(1) Soluble Manganese Citrate.

Before describing the preparation and characters of this new soluble salt, it would seem desirable to refer briefly to the various citrates of manganese that have heretofore been prepared, for the purpose of presenting some comments thereon.

These salts, as recorded in Beilstein's *Handbuch der organischen Chemie*, Bd. I., p. 838, have been studied chiefly by Kämmerer (Liebig's *Annalen*, cxlviii., 1868, p. 314), but the correctness of the composition assigned to some of them appears to be somewhat doubtful.

Kämmerer has stated that when manganous sulphate and sodium citrate are heated together in aqueous solution, in a certain degree of concentration, a crystalline, white precipitate is obtained, which, when dry, is slightly yellowish. The reaction has been represented by the following equation :—

$$2MnSO_4 + 2Na_3C_6H_5O_7 = MnH(C_6H_5O_7) + MnNa_2(C_6H_4O_7) + 2Na_2SO_4$$

The same salt is said to be obtained by heating manganous acetate with citric acid, or by heating together manganous sulphate, sodium acetate, and citric acid. Whereas Heldt had previously assigned to one of the above salts, obtained by the interaction of manganous carbonate and citric acid, the composition $MnHC_6H_5O_7 \cdot H_2O$, the salt obtained by Kämmerer was found to have the composition $2MnHC_6H_5O_7 \cdot H_2O$.

By heating together solutions of manganous acetate and citric acid, in the proportions of $1\frac{1}{2}$ molecules of the former to 1 molecule of the latter, Kämmerer obtained the salt $Mn_3(C_6H_5O_7)_2 \cdot 9H_2O$ as a crystalline powder, and from the mother liquor of this salt, by evaporating on a water-bath and precipitating with alcohol, a salt was obtained to which he assigned the composition $Mn_5H_2(C_6H_4O_7)_3 \cdot 15H_2O$. From the above mentioned mother liquor, by a slightly different procedure, he obtained a micro-crystalline salt, for which the composition $Mn_7H_2(C_6H_4O_7)_4 \cdot 18H_2O$ was given, and which was assumed to be formed by the following reaction :—

$$Mn_3(C_6H_5O_7)_2 + 2Mn_2(C_6H_4O_7) \cdot 18H_2O = Mn_7H_2(C_6H_4O_7)_4 \cdot 18H_2O$$

From the liquid obtained by neutralising manganous carbonate in the cold with citric acid, Kämmerer furthermore obtained a salt

which he considered to be a compound of a trimetallic and a tetrametallic salt, as represented by the following formula:—

$$Mn_3(C_6H_5O_7)_2 + Mn_2(C_6H_4O_7)\cdot 15H_2O = Mn_5H_2(C_6H_4O_7)_3\cdot 15H_2O$$

It will be observed that in the composition of several of the above-mentioned salts, as represented by Kämmerer, citric acid is regarded as tetrabasic. Although from the now well-known constitution of this acid,

$$\begin{array}{l} CH_2—COOH \\ | \\ C(OH)—COOH \\ | \\ CH_2—COOH \end{array}$$

it is seen to be tetratomic, it was recognised as tribasic by Liebig as long ago as 1838. It is therefore highly improbable that the composition of those salts can be correct which assumes the hydrogen of the alcoholic hydroxyl group to have been replaced by manganese.

Of the simple citrates of manganese two salts of different composition are found in commerce. Both of them occur in the form of a white powder, sparingly soluble in cold water. One of these, of German manufacture, was found by the writer to contain 17·8 per cent. of manganese, and is evidently an acid salt. A salt of the composition $MnHC_6H_5O_7\cdot 4H_2O$ would require 17·3 per cent. Mn. Another salt, of English manufacture, was found to be a normal manganese citrate, containing 23·58 per cent. Mn, and therefore corresponds to one of the salts first prepared by Kämmerer, namely, $Mn_3(C_6H_5O_7)_2\cdot 9H_2O$, which requires 23·3 per cent. Mn. These salts were assayed by simple ignition and weighing the residue as Mn_3O_4.

The last mentioned salt serves as the basis for the preparation of a soluble manganese citrate. Although obtained by Kämmerer (*loc. cit.*) by heating a solution of manganous acetate with citric acid, the writer has prepared it by the action of citric acid upon manganous carbonate in the following calculated proportions:—

$$\underset{\substack{669 \\ (100)}}{3MnSO_4\cdot 4H_2O} + \underset{\substack{858 \\ (128\cdot 2)}}{3Na_2CO_3\cdot 10H_2O} = \underset{\substack{345}}{3MnCO_3}$$

$$\underset{345}{3MnCO_3} + \underset{\substack{420 \\ (62\cdot 8)}}{2C_6H_8O_7\cdot H_2O} + Aq = \underset{\substack{703 \\ (105)}}{Mn_3(C_6H_5O_7)_2\cdot 9H_2O}$$

The proportions practically employed were as follows:—Manganese sulphate, cryst., 100 Gm.; sodium carbonate, cryst., 140 Gm.; citric acid, 62·8 Gm. The manganese sulphate and sodium carbonate are dissolved separately in a convenient quantity of water, with the aid of heat, and filtered. To the solution of manganese sulphate the sodium carbonate is added gradually, with constant stirring, and the precipitate, after being allowed to subside, is washed repeatedly by affusion and decantation with water until the washings afford not more than a slight reaction for sulphate. The moist manganese carbonate is then brought into a porcelain dish with a little water, the citric acid added, and the mixture heated on a water-bath for about half-an-hour, with occasional stirring. If the dry salt is desired, the product, which should form a somewhat thick mixture, is brought on a filter, washed with a little water, and dried at a gentle heat. It is thus obtained as a white crystalline powder, and the yield of the salt on a small scale is very nearly the theoretical. When essayed it afforded 23·17 per cent. Mn, as compared with 23·3 per cent. Mn calculated for $Mn_3(C_6H_5O_7)_2 \cdot 9H_2O$.

The Soluble Manganese Citrate was prepared as follows: To the simple manganese citrate, obtained as above from 100 Gm. manganese sulphate, while still moist and contained in a porcelain dish, 105 Gm. of crystallised sodium citrate are added, and the mixture heated on a water-bath until complete solution is effected. The liquid is then diluted sufficiently to filter readily, and at once spread on glass plates, so that on drying it may be obtained in the form of scales. The salt in the state of solution oxidises readily and becomes brown, but in the dry state it is quite permanent when protected from the light. The amount of sodium citrate employed corresponds very nearly to the following molecular proportions:—

$$\underset{703}{\underline{Mn_3(C_6H_5O_7)_2,9H_2O}} + \underset{714}{\underline{2Na_3C_6H_5O_7,5\tfrac{1}{2}H_2O.}}$$

The salt forms handsome pearly scales, which are very freely soluble in water. Like other similar scale salts, it cannot be considered a definite chemical compound, and is subject to slight variations in composition according to the care exercised in its preparation, the thickness of the scales, and the temperature at which they are dried. Several determinations of the manganese have shown the latter to vary within the limits of about 12 to 13 per cent.

In a paper entitled "Recherches sur les Citrates ammoniacaux," by Landrin (*Annales de Chimie et de Physique*, 1882, p. 233), the author (*loc. cit.*, p. 252) describes an ammonio-citrate of manganese, "*citrate de manganèse biammoniacal*," which is stated to have been prepared as follows: "*Si l'on fait réagir sur le citrate d'ammoniaque du carbonate de manganèse* (1 *éq d'acide citrique pour* 1 *éq de carbonate de manganèse*) *jusqu'à dissolution complète du carbonate, si l'on concentre la dissolution et si l'on fait cristalliser on obtient un sel en croutes cristalline.*"

To this salt Landrin assigns the formula $C_{12}H_5O_{11}\cdot 2AzH_4O,MnO$, which would correspond in the more modern notation to $Mn(NH_4)_4(C_6H_5O_7)_2$, and would contain theoretically 10·9 per cent. Mn. The author found 14·04 and 14·06 per cent. MnO = 10·9 per cent. Mn. It therefore contains somewhat less manganese than the salt prepared by me, and is otherwise different in its character.

It is stated by Landrin that from solutions of the salt prepared by him the manganese is not precipitated by ammonia nor by potassa, incompletely precipitated by alkali carbonates, and *completely precipitated by ammonium sulphydrate*, in the latter respect having a character contrary to that indicated by Spiller for the action of alkali monosulphides on solutions of manganous salts in alkali citrates (*Journ. Chem. Society*, 1858, vol. x. p. 110, and *Pharm. Journ.*, 1858, vol. xvii. p. 282).

In the paper by Spiller he records the following observation: "The protoxide of manganese is not precipitated by potassa, nor the carbonate by sodium carbonate, in presence of a soluble citrate. On exposure to the air the brown binoxide of manganese separates from the former only of these solutions. *Sulphide of manganese is not at all precipitated.*"

The soluble manganese citrate prepared by the writer is not precipitated by ammonia nor at once by potassa, although gradually forming with the latter a brown precipitate; it is either not precipitated by the alkali carbonates or gives but a slight turbidity. It is, however, at once and abundantly precipitated by ammonium sulphydrate, as also by potassium ferrocyanide.

In order to ascertain the cause of the above discrepancies, a solution was prepared in the manner and proportions indicated by Landrin. Although the manganese carbonate dissolved very slowly and incompletely in the solution of ammonium citrate, the solution obtained had the characters described, with the exception of not being precipitated by alkali carbonates. It was at once

abundantly precipitated by ammonium sulphydrate, and also by potassium ferrocyanide.

Solutions were then prepared by dissolving respectively one molecular proportion of manganese carbonate with one of citric acid, and one molecule of manganese carbonate with two molecules of citric acid, and subsequently in both cases neutralising the excess of acid with ammonia. The former of these solutions was precipitated by ammonium sulphydrate, whereas the latter remained perfectly clear at first, and a precipitate was only gradually formed. Both of these solutions were only gradually precipitated by potassium ferrocyanide.

The apparent discrepancy between the observations of Spiller and Landrin is therefore easily explained by the fact that the precipitation of manganese by ammonium sulphydrate in the presence of alkali citrates depends simply upon the greater or less amount of the latter that may be contained in the solution.

(2) Soluble Iron and Manganese Citrate.

A few years ago Dr. Da Costa, of Philadelphia, recommended the hypodermic use of iron, especially in those cases where a rapid action is needed, as after severe hæmorrhage, and for those people who have such delicate digestions that they cannot assimilate the iron when given by the mouth (*Lancet*, July 4th, 1896, p. 227). The preparation employed for this form of administration was stated to be a ferrous-manganese citrate, which is stable and has not the irritating properties of many other compounds. The solution was prepared by dissolving the salt in hot distilled water in the proportion of one grain to five minims. A preparation, possibly designed to meet these special requirements, has been issued by a German manufacturer under the name of Ferro-Manganum Citricum, and is in the form of reddish-brown scales, freely soluble in water. A specimen of this salt, examined by the writer, contained the iron, however, not in the ferrous, as the name would imply, but in the ferric state. An analysis showed the presence of 15·3 per cent. of iron and 9·7 per cent. of manganese.

The salt now brought to notice differs somewhat from the above in its character, and in the percentages of iron and manganese. It is calculated to contain as nearly as possible two parts of metallic iron to one part of manganese, and these proportions may be attained within very close approximations in practice.

The method adopted for the preparation of this compound is as follows. Simple manganese citrate is first prepared in the manner described under soluble manganese citrate. If, for example, 100 Gm. of crystallised manganous sulphate were employed for this purpose, this would correspond to 24·66 Gm. of manganese. A solution of ferric citrate is then taken, and the percentage of metallic iron contained therein is determined, for which purpose the iodometric method of assay is both accurate and convenient. If, for example, the iron solution, such as that of the U.S. Pharmacopœia, be found to contain 8 per cent. of metallic iron, 616·5 Gm. of it will be required in order to represent 49·3 Gm. of iron, an amount corresponding to twice that of the manganese employed.

To the moist manganese citrate contained in a porcelain dish, is added the solution of ferric citrate, and the mixture heated on a water-bath until complete solution is effected. The liquid is then filtered, evaporated to the consistence of syrup, and spread on plates of glass, so that on drying it may be obtained in the form of scales. It forms handsome yellowish-brown scales, which are readily soluble in water, especially when slightly warmed, affording a clear, yellowish solution. The solution is not precipitated by ammonia, which produces a deep red colour; with potassium ferrocyanide it affords a light blue precipitate, changing to deep blue on the addition of a mineral acid.

The salt may easily be assayed by igniting a portion for the determination of the total mixed oxides, and then in this residue or in a separate portion of the salt determining the iron volumetrically. The amount of metallic iron found is subsequently calculated as Fe_2O_3, the latter deducted from the total amount of oxide, and the remainder, consisting of Mn_3O_4, calculated for the corresponding percentage of manganese.

An example of the remarkable degree of accuracy with which the calculated proportions may be maintained in the finished product, with proper care in the manipulations, is afforded by the following analysis. In a portion of the salt the iron was determined iodometrically as 13·39 per cent. Fe. 0·4520 Gm. of the salt gave upon ignition 0·1282 Gm. of total mixed oxides. 13·39 per cent. Fe. = 19·13 per cent. Fe_2O_3 or 0·0864 Gm. Fe_2O_3. Therefore, 0·1282 — 0·0864 = 0·0418 Gm. Mn_3O_4 = 0·03 Gm. Mn, or 6·63 per cent. Mn. There was thus found 13·39 per cent. Fe and 6·63 per cent. Mn. When made on a somewhat larger scale the salt ordinarily contains about 14 per cent. of iron and 7 per cent of manganese.

(3) Soluble Iron and Manganese Phosphate.

The salt is calculated to contain the same relative proportions of iron and manganese as the preceding, and its method of preparation is precisely analogous. Like the so-called Soluble Phosphate of Iron of the U.S. Pharmacopœia, it is really a citro-phosphate. It was prepared in the following manner: Manganese sulphate, cryst., 100 Gm.; sodium phosphate, cryst., 240 Gm.; solution of ferric citrate (containing 8 per cent. Fe), 616·5 Gm., or a corresponding amount of solution of other percentage strength.

The salts are dissolved separately in a sufficient amount of water with the aid of heat, and filtered. To the solution of manganese sulphate, while warm, is added the warm solution of sodium phosphate. The precipitate of manganese phosphate is allowed to subside, and washed by affusion and decantation with water until the washings afford not more than a very slight reaction for sulphate. The precipitate, while still moist, is then brought into a porcelain dish, the solution of ferric citrate added, and the mixture heated on a water-bath until complete solution is effected. It is then filtered and the liquid spread on glass to scale in the usual manner. The salt should be kept protected from the light.

It forms handsome, greenish-yellow scales which are slowly soluble in cold, but readily in warm, water, and the solution has the general properties described under Iron and Manganese Citrate. Like the latter, it ordinarily contains about 14 per cent. of iron and 7 per cent. of manganese. The amount of iron contained in the salt may be readily and directly determined by the iodometric method, whilst for the determination of the manganese the usual gravimetric methods for the separation of the two metals must be resorted to, with the consideration of the presence of both citric and phosphoric acids.

In conclusion it may be suggested that, in view of the combined character of these compounds—their ready solubility in water, their freedom from objectionable taste, and relative uniformity in the amount of their constituent elements—they would appear to merit favourable consideration and to be well adapted for medicinal use.

The Wellcome Chemical Research Laboratories.

THE CHEMICAL CHARACTER OF SO-CALLED IODO-TANNIN COMPOUNDS.

By

Frederick B. Power, Ph.D. and Frank Shedden, B.Sc., A.I.C.

A number of preparations made by the action of iodine upon tannic acid, or upon drugs containing considerable amounts of tannin, such as krameria, cinchona, etc., have been used medicinally for many years, especially in France, where they appear to have originated. These preparations are usually in the form of a syrup or wine, and various working formulæ for them have been published (see, for example, *Rép. de Pharm.*, 1896, pp. 145–150; Hager's *Handbuch*, Bd. i. p. 138, Bd. ii. p. 141; also the "Sirup de Raifort Iodé" of the French Codex). Since they contain no free iodine it is usually assumed, or even definitely stated, that the iodine is in organic combination with the tannin, and that they are therefore more readily assimilated than the alkali iodides, whilst not producing the unpleasant effects which sometimes attend the use of the latter.

The behaviour of iodine towards a solution of tannic acid is referred to in several works on pharmaceutical chemistry, but usually without any definite statement as to the character of the product formed. Thus, in Schmidt's *Pharm. Chemie*, 3rd edit., Bd. ii. p. 1,017, it is stated: "A solution of tannic acid takes up iodine in considerable amounts, forming a reddish-brown liquid, in which free iodine can no longer be detected by starch paste." Practically the same statement occurs in Hager's *Handbuch*, Bd. i. p. 134, with the additional conclusion that the liquid contains *organically combined iodine*, from the fact that the presence of this "element cannot be detected by starch." Flückiger, *Pharm. Chemie*, 2nd edit., pt. ii. p. 356, has recorded the following observation: "1 part of powdered iodine affords with a solution of 7 parts of tannic acid in 50 parts of water, a turbid, reddish-brown liquid, which can be diluted without the separation of iodine, and produces no blue precipitate in solutions of starch."

The first study of the chemical changes which take place by the action of iodine on tannin appears to have been made by Socquet and Guilliermond, in a paper entitled "Sur une nouvelle combinaison de l'iode" (*Journ. de Pharm. et de Chemie*, 3 série, t. xxvi., 1854, pp. 280-285). The notice given in Gmelin-Kraut's

Handbuch der Chemie, Bd. vii., 1862, p. 884, or in the Cavendish edition, 1862, vol. xv. p. 459, is apparently a brief abstract of the preceding paper.

With reference to the observations of Socquet and Guillermond (*loc. cit.*) the following points may be noted. They observed that the action of iodine upon tannin only takes place in the presence of water, and that in alcoholic solution no reaction ensues, however prolonged may be the contact. They then further state that "tannin, in aqueous solution, can thus dissolve considerable quantities of iodine—as much as half its own weight. What is remarkable in this absorption of iodine by tannin is that if it is arrested when a certain proportion exists between the two substances one will see that *a true chemical combination is effected.*"

They observed that from the iodo-tannin solution a sparingly soluble substance was separated, which was estimated to amount to about one-sixth of the weight of tannin employed. When washed with water and dried it did not retain any trace of iodine, which remained entirely in the solution from which it was deposited, but, as it had an acid character and retained some of the properties of tannin, it was regarded as *an altered tannin.* The iodo-tannin solution was found to be more strongly acid than a solution containing simply the same amount of tannin, but to show the same deportment as the latter towards various reagents. It does not stain the skin, and the taste and odour do not permit of the recognition of iodine. It is capable of absorbing an additional quantity of iodine, and the highly-coloured solution then possesses the odour of iodine.

In order to ascertain the nature of the combination formed by the tannin and iodine, Socquet and Guilliermond conducted the following simple experiments:—

(1) With a solution of lime a precipitate of calcium tannate was obtained, whilst the iodine remained in solution as calcium iodide.

(2) With gelatin a precipitate was obtained which, when thoroughly washed with water, was found to contain no iodine, the latter remaining entirely in the solution in a state of combination, although accompanied by some tannate of gelatin, which was difficult to separate.

(3) With lead acetate a precipitate of lead iodide was first obtained, and subsequently lead tannate was precipitated.

(4) On evaporating the iodo-tannin solution no free iodine was

developed until it approached the point of dryness. A similar result was obtained on distilling a large volume of the solution, when a purely aqueous distillate was obtained, and a strongly acid solution, containing no free iodine, was left in the retort.

From these results they arrived at the following conclusions: "That during the contact of the water, iodine, and tannin a portion of the water becomes decomposed; that hydriodic acid is formed, and that a portion of the tannin is transformed by oxidation into a particular tannin which is less soluble than ordinary tannin, and that *the unaltered tannin forms, with hydriodic acid, a soluble and stable combination which even distillation is not able to change.*

The same authors finally proposed a formula for an iodo-tannin syrup, and recommended extract of rhatany to be used for this purpose in place of gallo-tannic acid, on account of the disagreeable astringency of the latter.

Barnouvin (*Rép. de Pharm.*, 1892, p. 350, and *Proc. Amer. Pharm. Assoc.*, 1893, vol. xli. pp. 578, 775), in a paper entitled "Composés iodo-tanniques," has described a so-called "iodo-tannin compound" which he prepared by adding iodine to tannin in such a proportion that after standing for an hour or two it no longer gave a reaction for free iodine with starch. It was then evaporated to a syrupy consistence, spread on glass, and thus obtained in yellowish-brown scales, which were soluble in water and in alcohol. No statement is made in the paper respecting the amount of iodine contained in this preparation, nor does it appear to have been ascertained that it actually contained iodine; but the opinion was expressed that the study of the subject with reference to the compounds of iodine with organic bodies might be of some interest. It was also incidentally noted that a large number of other organic bodies besides tannin, such as those contained in extracts, syrups, etc., have the property of effecting this so-called dissimulation of iodine.

In a later paper by Barnouvin, entitled "Sur l'iode dissimulé" (*Rép. de Pharm.*, 1898, 3 sér., x., p. 337), the action of iodine upon gallic acid is considered. In this paper the author refers to the action of iodine upon tannin, and states that gallic acid possesses the same property, being capable of absorbing as much as a third of its weight of iodine. The iodine thus combined is only made manifest by the action of nitrous acid or an alkali hypochlorite. The so-called iodo-gallic solution left on

evaporation a yellowish, amorphous residue, sparingly soluble in water, which only reacted with starch after the addition of the above-mentioned reagents. On treating this residue with ether, and evaporating the latter, crystals consisting of fine needles were obtained, which were sparingly soluble in water. Since these crystals afforded a reaction for iodine under the conditions previously mentioned, they were regarded as a definite compound (an iodo-gallic acid), comparable to bromo-gallic acid, and it was noted that from this point of view the fact was of sufficient interest to call for further research. We have considered this question in connection with our experimental work.

The latest study of so-called iodo-tannin preparations, which, however, were considered more especially with regard to their pharmaceutical character than their chemical composition, was embodied in a paper by Professor Gay, entitled: "Sur les sirops iodo-tanniques et la dissimulation de l'iode par le sucre inverti" (*Rép. de Pharm.*, 1896, pp. 145-150).

The author, referring to the observations of Guilliermond, states that the absorption of iodine by tannin indicates a true combination between the two bodies. He considers that a portion of the iodine is introduced into the tannin molecule, while another portion forms hydriodic acid, the tannin at the same time suffering a partial decomposition with the formation of gallic acid and even ellagic acid. He noted, furthermore, that the reaction deserves to be examined more closely than it has been possible for him as yet to do.

Professor Gay then describes the various methods for the preparation of iodo-tannin syrups, and records a number of experiments as evidence of the so-called absorption or dissimulation of iodine by invert sugar or by glucose. He especially calls attention to the difference in character of the iodo-tannin syrup when prepared by the method of Guilliermond, in which the iodine, dissolved in a little alcohol, is first allowed to act upon extract of rhatany dissolved in water, and the solution subsequently converted into a syrup by the addition of sugar, or when prepared by the method adopted by the Paris School of Pharmacy, in which the iodine, dissolved in a little alcohol, is added to a syrup of rhatany, and allowed to stand until it no longer gives a reaction for free iodine with starch. By the first method the iodine is considered to be dissimulated by the tannin of the extract of rhatany, whereas by the second method it acts upon the cane

sugar, and, to a greater or less extent, is dissimulated by the invert sugar thus produced. A similar difference exists between the formula of Berthet, as adopted by the formulary of the Civil Hospital of Paris, and the formula of Perrens (*Journ. de Pharm. et de Chim.* [4], xvi. p. 48).

With regard to the practical conclusions to be drawn from these facts, Professor Gay considers that from a therapeutic point of view it matters but little whether the iodine is dissimulated by the tannin or by the sugar, although the latter is more readily assimilated, and, furthermore, the question is raised whether medical men who prescribe these compounds pretend to utilise the physiological properties of tannin, or whether they only regard it as an agent for the dissimulation of the iodine. In the latter case it is suggested that preference should be given to such preparations as the iodised syrup of horseradish of the Codex, or to an iodised syrup of citric acid.

Our purpose in this investigation was to ascertain the chemical character of the preparations produced by the action of iodine upon tannic and gallic acids, with consideration of the various statements that have been made respecting them, to which we have referred. Such a study of the subject seemed the more desirable in view of the fact that no definite compound of iodine with either tannic or gallic acid has yet been described, although the well-known bromo- and dibromo-gallic acids, $C_6HBr(OH)_3COOH$ and $C_6Br_2(OH)_3COOH$, are very easily prepared.

Experimental.

In the first place the amount of iodine reacting with, or taken up by, tannic and gallic acids in aqueous solution was determined, under different conditions of time and temperature.

For these experiments the following solutions were employed: (*a*) A 1 per cent. solution of tannin; (*b*) a 0·5 per cent. solution of gallic acid; (*c*) a standard solution of iodine in potassium iodide, which was approximately decinormal.

To a convenient quantity of the solution of tannic or gallic acid, contained in a glass-stoppered bottle, an excess of solution of iodine was added, and the mixture allowed to stand, either at the ordinary temperature or in a water-bath, for the time specified. The contents of the bottle were then transferred to a beaker, diluted with a little water, starch added, and subsequently a decinormal solution of sodium thiosulphate run in until the green coloration changed to light brown, the colour of the

oxidation product. The following results were obtained, from which it will be seen that gallic acid is more readily acted upon than tannic acid:—

No.	Amount of Tannin.	Amount of Iodine Absorbed.	Time in Hours.	Condition of Experiment.
1	0·10 Gm.	0·036 Gm.	1	Cold.
2	0·10 ,,	0·037 ,,	4	,,
3	0·10 ,,	0·051 ,,	24	,,
1	0·10 Gm.	0·162 Gm.	1	Heated in water-bath.
2	0·10 ,,	0·196 ,,	4	,, ,,
3	0·10 ,,	0·225 ,,	8	,, ,,

No.	Amount of Gallic Acid.	Amount of Iodine Absorbed.	Time in Hours.	Condition of Experiment.
1	0·10 Gm.	0·088 Gm.	1	Cold.
2	0·10 ,,	0·092 ,,	4	,,
3	0·10 ,,	0·178 ,,	24	,,
1	0·10 Gm.	0·367 Gm.	1	Heated in water-bath.
2	0·10 ,,	0·414 ,,	4	,, ,,
3	0·10 ,,	0·474 ,,	8	,, ,,

The amount of iodine necessary to react with 0·10 Gm. of tannic acid to form a mono-substitution product would be 0·078 Gm.; to form a di-substitution product 0·157 Gm.

The amount of iodine necessary to react with 0·10 Gm. of gallic acid to form a mono-substitution product would be 0·135 Gm.; to form a di-substitution product 0·270 Gm.

It will be seen, however, that the amounts of iodine taken up are very variable, and are not in any definite molecular proportion to the tannic or gallic acid employed. Even where an approximation to such a proportion may exist, it is evidently to be regarded as a mere coincidence.

Action of Iodine upon Tannic Acid.

(1) 5·0 Gm. of tannin, 1·275 Gm. of iodine, and about 60 c.c. of water were heated together in a glass-stoppered bottle until the free iodine had disappeared. After standing for twenty-four hours the liquid deposited about 0·5 Gm. of a dark brown powder, which gave the ellagic acid reaction (that is, a blood-red colour

with fuming nitric acid and water). The formation of ellagic acid, $C_{14}H_8O_9$, by the action of iodine on tannic and gallic acids in the presence of water, as also the colour reaction referred to, was first observed by Griessmayer (Liebig's *Annalen*, 160, p. 51). The filtered liquid was diluted with water to the measure of 250 c.c.

(*a*) 50 c.c. of this liquid were digested with 2 Gm. of hide powder for several days, then filtered, the powder well washed, and the combined liquids titrated with N/10 NaOH, using methyl orange as an indicator. This required 7·7 c.c. N/10 NaOH. The powder was then mixed with 10 c.c. N/10 NaOH solution, filtered, and the excess of the latter titrated with N/10 H_2SO_4, for which 2 c.c. were required. The total amount of acid present was, therefore, equivalent to 15·7 c.c. N/10 NaOH, corresponding to 0·997 Gm. of iodine as hydriodic acid in 250 c.c. of liquid.

In order to confirm this result, both the liquids after titration were mixed, acidified with nitric acid, filtered, and precipitated with silver nitrate. 0·384 Gm. of silver iodide was obtained, corresponding to 0·207 Gm. of iodine or 1·035 Gm. iodine in 250 c.c. of the original liquid. A large proportion of the iodine used had therefore been converted into hydriodic acid. The hide powder remaining from this experiment, after treating with fuming nitric acid, diluting and shaking with chloroform, was found to contain no iodine.

(*b*) Another portion of the original liquid was shaken out with ether, when a small amount of a varnish-like substance was obtained, which resembled tannin in its properties and contained no iodine.

(2) In another experiment 8·0 Gm. of tannin and 1·1188 Gm. of iodine were digested with water in a glass-stoppered bottle until the free iodine had completely disappeared. The liquid, when cold, was filtered from the small amount of ellagic acid formed, and diluted with water to the measure of 250 c.c.

(*a*) 50 c.c. of this solution were diluted with water, and heated on a water-bath with a little dilute sulphuric acid and an excess of silver nitrate. 0·4412 Gm. of silver iodide was obtained, corresponding to 0·2222 Gm. of iodine, or to 1·1110 Gm. of iodine in 250 c.c. of liquid. The filtrate from the above was heated with a little fuming nitric acid, when an additional 0·0028 Gm. of silver iodide was obtained, corresponding to 0·0015 Gm. of iodine, or to 0·0075 Gm. in 250 c.c. The total amount of iodine found

was thus: 1·1110 + 0·0075 = 1·1185 Gm., as compared with 1·1185 Gm., the amount originally taken.

(*b*) Another portion of 50 c.c. of the liquid was treated with hide powder, and the filtrate therefrom acidulated with nitric acid and precipitated by silver nitrate. 0·2586 Gm. of silver iodide was obtained, corresponding to 0·1397 Gm. of iodine. The hide powder was then treated with a dilute solution of sodium carbonate, filtered, and the filtrate acidulated with nitric acid, when a precipitate was produced which was filtered off, but neither this precipitate nor the remaining hide powder then gave any reaction for iodine. The filtrate, however, gave with silver nitrate an additional 0·1526 Gm. of silver iodide, corresponding to 0·0825 Gm. of iodine. The total amount of iodine found was thus: 0·1397 + 0·0825 = 0·2222 Gm., as compared with 0·2238 Gm. originally contained in the 50 c.c. of solution employed.

(*c*) Another portion of 50 c.c. of the liquid was first concentrated to a small bulk on a water-bath, and then kept in a vacuous desiccator over lime and sulphuric acid for two or three days. The dry residue was in the form of light brown scales, which were slowly soluble in water, and which would correspond to the so-called iodo-tannin compound obtained by Barnouvin (*loc. cit.*). The solution of this substance gave a slight purple colour to chloroform, showing the presence of a little free iodine, but it also afforded an intense blue-black colour with ferric chloride. On the addition of sodium chloride a precipitate was obtained similar to that produced in a solution of tannin, but which contained no iodine. From the solution, acidulated with nitric acid, the whole of the halogen was precipitated by silver nitrate. A little of the substance was boiled with acetic anhydride. A part of this liquid was diluted with hot water and another part with alcohol, but in both cases the precipitated products contained no iodine. 1·0488 Gm. of the above-described scales, in the form of powder, were heated in a flask provided with a ground glass condenser with an excess of silver nitrate and a little fuming nitric acid. The contents of the flask, after dilution, gave 0·2098 Gm. of silver iodide, corresponding to 0·1134 Gm. of iodine, or 10·8 per cent.

(*d*) A portion of the original solution was extracted with ether, the latter washed twice, and the ether distilled off. The residue was a pale brown varnish, containing no halogen.

(*e*) A portion of the original solution was evaporated on a water-bath to complete dryness, and kept in a water-oven for a day.

The product was a black powder, which gave a slight reaction for free iodine when shaken with chloroform.

Action of Iodine upon Gallic Acid.

(1) 5 Gm. of gallic acid, 1·2615 Gm. of iodine, and about 50 c.c. of water were heated together in a glass-stoppered bottle on a water-bath for several hours until the free iodine had disappeared. The liquid, while hot, was filtered from a small amount of a black powder, which gave the reaction for ellagic acid. From the cold filtrate gallic acid separated out. This, when filtered off, washed and dried, weighed 3·6 Gm., and contained no iodine. The combined filtrate and washings from this gallic acid were diluted with water to the measure of 250 c.c.

(*a*) 25 c.c. of this solution were boiled with dilute sulphuric acid and excess of ferric chloride, and the liberated iodine absorbed by a solution of potassium iodide. The liquid required 8·9 c.c. N/10 sodium thiosulphate, corresponding to 1·13 Gm. of iodine in 250 c.c.

(*b*) Two portions of 25 c.c. each were extracted three times with ether to remove any free gallic acid, boiled with animal charcoal, and titrated with N/10 sodium hydrate solution, using methyl orange as an indicator. One portion required 9·0 c.c. N/10 NaOH, and another portion 8·8 c.c. N/10 NaOH, the mean being 8·9 c.c., which corresponds to 1·13 Gm. of iodine in 250 c.c. of liquid. These two concordant results not only represent approximately the amount of iodine originally taken, but indicate that all of the iodine contained in the solution is in the form of hydriodic acid.

(2) As a confirmative experiment 1·0 Gm. of gallic acid and 1·964 Gm. of iodine, with some water, were heated together in a glass-stoppered bottle in a water-bath for two hours, and the solution diluted with water to the measure of 250 c.c.

(*a*) 25 c.c. of the solution were largely diluted and titrated with N/10 sodium thiosulphate, using starch as an indicator. 3·1 c.c. N/10 thiosulphate were required to remove the dark coloration. After acidulating with sulphuric acid an excess of silver nitrate was added, when 0·3776 Gm. of silver iodide was obtained, corresponding to 0·204 Gm. of iodine, as compared with 0·196 Gm. originally taken.

(*b*) Another 25 c.c. of the solution required 3·2 c.c. N/10 thiosulphate, and gave 0·3790 Gm. of silver iodide, corresponding to 0·205 Gm. of iodine.

(3) 4·0 Gm. of gallic acid and 1 Gm. of iodine, with some water, were heated together in a glass-stoppered bottle until all the free iodine had disappeared. The liquid was filtered, while hot, from a small amount of a black powder, which gave the ellagic acid reaction.

(*a*) A portion of the solution when evaporated on a water-bath gave off fumes of hydriodic acid as it became concentrated. When thoroughly dry it gave no reaction for halogen when heated with silver nitrate and fuming nitric acid.

(*b*) Another portion of the solution was first concentrated to a small bulk on a water-bath, and then kept in a vacuous desiccator over lime and sulphuric acid for two or three days. The product was found to be free from halogen.

(*c*) Another portion of the solution was extracted with ether, the latter washed twice with water, and the ether then distilled off. The residue was a light brown crystalline powder, containing no halogen, and consisted of unchanged gallic acid.

From these results there can be little doubt that the crystalline product obtained by Barnouvin (*loc. cit.*) under similar conditions, and which he assumed to be an iodo-gallic acid, although apparently without having further examined it, consisted simply of gallic acid with a little adhering hydriodic acid.

In this connection it may be noted that some preparations designed for medicinal use have recently been patented by German manufacturers under the designations of "Tanninhaltiger Jodleimverbindungen" (Iodo-gelatin compounds with tannin), "Bromtannineiweiss-Verbindungen" (Bromo-tannin albumen compounds), etc. Compare *Chemiker Zeitung*, 1901, No. 9, p. 91, and No. 41, p. 449. These are stated to be prepared by precipitating respectively a solution containing iodine and tannin with gelatin, or a solution of bromine and tannin with albumen. It is obvious, however, that these preparations are of a very different character from those which have formed the subject of our consideration.

The preceding experiments would thus appear to have established the fact that true or definite compounds of iodine with either tannic or gallic acid cannot be formed by the simple interaction of these bodies in the presence of water, for, as might be expected, under these circumstances the iodine acts simply as an oxidising agent. The resulting products, therefore, contain the iodine in the form of hydriodic acid, associated with more or less unaltered tannic or gallic acid, and the oxidation products of the latter.

In accordance with these facts, and with the opinion previously

expressed by Professor Gay (*loc. cit.*), it follows that unless the physiological action of tannin is desired conjointly with that of the iodine there is no necessity for its use as a means of effecting the chemical change resulting in the so-called dissimulation of the iodine. In place, however, of the various other expedients that have been proposed for attaining this result, it would be more rational, from the standpoint of accuracy in medicine, to employ a preparation containing a definite amount of hydriodic acid, for which a syrup is probably best adapted, the strength and dosage of which can so easily be controlled.

As a further result of this investigation, and in the attempt to obtain a definite compound of iodine with tannic or gallic acid, we have been led to undertake a more extended chemical study of these acids and some derivatives of them, and this is still engaging our attention.

THE WELLCOME CHEMICAL RESEARCH LABORATORIES.

Dr. ATTFIELD remarked that Dr. Power was evidently not quite sure what the therapeutic action of manganese might be, or whether it had any at all. He would like to emphasise the point that once more pharmacology on the chemical side was ahead of pharmacology on the medical side. Pharmacists were prepared to supply whatever manganese compounds medical men might require, and several salts were already prepared, and were awaiting medical investigation. As to the pseudo-tannin compounds, he must admit that his eyes were being opened in this matter. They had all been wondering what was the chemical character of those articles; and if Dr. Power had not quite decided the question he had gone very far in that direction.

Dr. SYMES said Dr. Power might be encouraged by knowing that where oxide of manganese had been prescribed formally, a solution of ammonio-citrate, prepared somewhat on the lines of the bismuth preparations, had been found advantageous, and he knew of one or two medical men who prescribed it successfully.

The PRESIDENT, in moving a vote of thanks to Dr. Power, remarked that the fact of manganese being present in river water, and being taken up from it by plants, went to show that it had some physiological effect.

Dr. POWER, in responding, said he would have much pleasure in presenting the specimens he had produced to the Pharmaceutical Society of Ireland, which Mr. Beggs acknowledged.

At this stage the meeting had the opportunity of seeing how the lantern in the Lecture Theatre is worked, as Dr. Power showed the slides illustrating Mr. Perrédès' paper on Robinia bark. From the dome of the lecture-theatre an umbrella-shaped blind descended and darkened the theatre. Then the slides were shown, and so pleased the meeting that Dr. POWER, the PRESIDENT, and Dr. ATTFIELD were required to propose the requisite votes of thanks.

The next paper was read by Mr. COWLEY :—

ADDITIONAL NOTES ON CARDAMOM FRUITS.

By R. C. COWLEY AND J. P. CATFORD.

In a paper read before the Liverpool Chemists' Association we pointed out that combustion of cardamom seeds in a platinum dish leads to inaccurate results, owing to reduction of the phosphorus compounds into phosphides, and we suggested the use of ammonium nitrate as an oxidising agent to complete the oxidation. Further experiments on different samples have shown, however, that combustion in a clay pipe, also then suggested, produces results which closely correspond with those obtained with the use of the oxidiser. Neither method is, however, by any means perfect. In the present case samples of the three chief commercial varieties were examined—viz., Malabars, Mysores, and Mangalores—to ascertain how far they agreed or differed from the results obtained by us with other samples, and published in the paper referred to. Some of these results may be summarised as follows :—

Variety.	Malabar.	Mysore.	Mangalore.
No. of fruits in 10 Gm.	80	55	45
Percentage proportion of pericarp . .	30	25	20
Percentage proportion of seed	70 { dark, 57 / light, 13	75	80
Percentage of ash from dark seed. . .	5·0	3·3	2·9
Percentage of ash from light seed . .	8·5–9	4·5	—
Percentage of ash from pericarp . . .	13·0	7·1	7·6

Lime was again found to predominate in the pericarps of all varieties to such an extent that an admixture of 20 per cent. of pericarp with seed would be readily distinguished by precipitation as oxalate from the acetic acid solution of the ash. Two-thirds the ash of Malabar pericarp is soluble in acetic acid, but of the seed ash

less than one half is soluble, and this portion is mainly composed of potassium salts.

Manganese and iron are present in all varieties both in the pericarp and the seed, but in the Mysores there are only comparatively small traces shown when small quantities are examined, such as would be used for pharmacopœial testing. Cobalt was not found in any of the three varieties—a result which entirely differs from those obtained from previous experiments with other seeds; but, as we have already suggested, the minerals present may be an indication of the geographical source of the drug, and this we are ignorant of as regards the samples under consideration. Comparing dark and light Malabar seed by fusing them with alkaline nitrate and carbonate, and boiling the product with water, there was no notable difference in the proportion of metallic oxides (Fe and Mn), a result which also differs from previous observation. The small proportion of lime, of course, remains in the insoluble portion as carbonate. We have already shown that the phosphorus exists in the seed in the form of organic compounds, which is evident from the liberation of phosphene when the seeds are projected into fused alkali; indeed, we question whether any phosphates exist in them.

A quantitative test for volatile oil would not be so complicated or tedious as many of the standardising processes commonly in use. Absolute accuracy is not essential—*e.g.*, 10 Gm. of seed might be required to yield 0·3 to 0·4 c.c. of volatile oil.

The summary of our results is as follows: (1) An ash determination of cardamom seed in itself is of questionable value as an index of the quality. (2) The mineral constituents are not constant, even in individual varieties. (3) The large proportion of lime in the pericarp is characteristic of all varieties. (4) The ash percentage of light-coloured seed is always higher than that of the dark, no doubt from the imperfect development of the organic matter.

An important question will arise in our minds from the results of these investigations and those of others, and which we are not in a position to answer—viz., Is the high proportion of mineral substances in Malabar cardamoms a matter to be ignored, or does the medicinal action of the drug depend entirely on the volatile oil? We think not.

We are indebted to Messrs. Evans, Sons, and Co., of Liverpool, for the specimens of drugs we have examined.

A vote of thanks to the authors of the above paper was cordially passed.

A portion only of the next paper was read by the author, who explained some of the apparatus described therein.

UNIFORMITY IN DISPENSING.

By Arthur L. Doran, M.P.S.I.

That illustrious scientist and prince of expositors, Michael Faraday, on being asked by a diffident tyro, about to address a highly cultured and critical audience, what he might suppose his hearers to know already, answered emphatically, "Nothing." That this anecdote is introduced here as an exemplar of procedure rather than any comparison of personalities, it is, perhaps, scarcely necessary to add, for does not even the derided "man in the street" diagnose our tribe something after this fashion: "These pharmaceutical chemists are usually men of superior intelligence, good to get information from, but, poor beggars! the trail of the shop is over them all."

In the three kingdoms there is probably not a member of our craft keeping open shop who does not somewhere or other on his frontispiece, labels, or circulars, make the claim that he dispenses prescriptions accurately; indeed, do not some of us prefix to this assertion that tremendous little word *all*, which may well suggest to the logical reader some rather awkward inferences; thus, for instance, that there are certain other chemists, reprobate fellows, who do not dispense *all* prescriptions entrusted to them correctly; or that he, the adviser, is like unto that one of whom Empedocles sings:—

> "And patiently exact—
> This universal God,
> Alike to any act,
> Proceeds at any nod."

and will accordingly indifferently handle for you the knotted recipe of some ancient Peruvian prescriber, a cuneiform Assyrian state formula, or the most recent glypt excavated at Knasos.

Returning to the practical, however, the great desideratum remains of securing as far as possible such a condition of affairs that, wherever a prescription may be presented from John O' Groat's to Land's End, or Malin Head to Cape Clear, the patient shall receive as nearly as possible a uniform product.

It is therefore not unworthy of the present representative assembly that we should consider for a little the means available for

securing this important object and for justifying the foregoing extensive claim.

Categorically they naturally fall into two classes, official and officinal aids.

On the official side we have, of course, that much belaboured and multi-criticised volume, the British Pharmacopœia. Now I believe I shall be but expressing the sense of the majority of pharmaceutical chemists when I say that however great an improvement on its predecessors the official guide published in 1898 may be, yet it cannot be considered on the whole a satisfactory book by those who are compelled to use it.

Moreover, that as long as the present obsolete and somewhat jealous system of compilation which the General Medical Council has set up is adhered to, there is but little probability of radical amendment.

And again, owing to the ever growing tendency to make it a standard for legal purposes, it has become a source of positive danger to pharmacists, leading to vexatious proceedings at the hands of officials not always so well informed as they might be.

In a general consideration of the unfitness of the B.P., we cannot omit to reiterate the observation that medical men themselves write "Mene, mene, tekel, upharsin," when they exclude almost without exception this volume from their works of reference.

It is to be hoped that in future editions of that which should constitute the very *fons et origo* of uniformity the medical men entrusted with the task will content themselves with fixing deletions and additions, strengths and doses, and will leave the forms and details to those representatives of wholesale and retail pharmacy who have given clear evidence of their ability to handle, aided and guided by the synergetic efforts of scientific specialists wherever necessary.

Then, and then only, we shall have an official guide worthy of our great and expanding Empire, and to which it will be possible to give both that practical and theoretical allegiance which make so strongly for uniformity.

Turning now to officinal methods, or those pertaining to the shop, as within limits it is lawful for every man to carry out his own ideas, the probability of want of uniformity in dispensing becomes very high, and, so far, I am aware very little has been done to minimise it.

In general, outside the Pharmacopœia, we are guided by the usages of the best men, by certain current traditions, and last, but

by no means least, by the well served weekly pharmaceutical Press, which so favourably affects the solidarity of our work, not only throughout the three Kingdoms, but also to the ends of the Empire, which, as you are well aware, are conterminous with those of the earth.

Of the special items I wish to bring before you to-day, first let us glance at that product of ignorance, carelessness, or local usage grown of nature—the ambiguous prescription—by which at one time or another so many of us have had our business arrested and our tempers ruffled. An example is, as usual, the best way to state the case. A prescriber in the Riviera writes after the astrological sign, pepsin chloridi, together with other things in a tincture. From the *prima facie* evidence of its stamps the recipe has been dispensed there and in London. What happens? The patient is delayed—all available authorities are consulted—the wholesale houses are strongly moved to procure or explain. Nett result is, as with the Bishop's little problem in entomology, nobody knows. The chemist who dispensed it in London is finally consulted, and with the courtesy characteristic of chemists to one another, replies—he doesn't know, but used scale pepsine. We now do the same, and with apologies to the patient, the prescription is at last dispensed.

Now this sort of thing is of fairly frequent occurrence, and we obviously want urgently the adoption of some convention that in all such cases the first dispenser (who generally knows or can readily find out what the prescriber means) shall make a minute note of what he has done, say, just under his recipe stamp, for the guidance of any and all subsequent dispensers who may care to secure uniformity by conforming to his practice as thus indicated.

It is, of course, well known to you that in the eyes of the public the first compounder is always right. Naturally the patient having taken his stuff and survived, cherishes a prejudice in his favour.

The general adoption of the foregoing simple rule would mean a substantial saving in time, prestige, and hard cash to all those engaged in pharmacy. It is earnestly to be desired that no slipshod work of any kind nor unnecessary divergence from the prescriber's directions be permitted. If uniformity is to be a real object, the methods of the laboratory must be applied as thoroughly as possible to the everyday shop work.

You cannot, for example, take the word of a bottle against the evidence of your graduate measure, and no dispensing by volume

will be quite right, and may be very wrong, if it be not made up to its ordered amount before being finally dispensed.

Eight-ounce bottles holding only 7½ ounces are by no means uncommon phenomena, and if your trust is in these the patient or inspector may have something serious to say in the matter.

From the infirmity of glass bottle-making all graduated-on-the glass bottles should be suspected, and are best rejected *in toto* and substituted by a plain bottle bearing a special label on the back giving the equivalent in *medical* spoons of the part ordered.

I must strongly protest here against what appears to be a somewhat general practice, that of straining out of mixtures, precipitates and deposits on the score of elegance, and without the usual "caletur," which should alone authorise such a procedure.

Our present knowledge of cytology will have to be greatly extended before we can positively assert that such precipitates are quite inert. In any case their removal is a function of the prescriber, not the dispenser.

The latter's duty is done when he exhibits the medicine in such a state that it can be administered in equal doses, be they clear or turbid.

A further little note that would serve our object is to avoid chemical action in dispensing if possible; if not possible then accelerate it to completion.

Attention to this would make it impossible for the well-known soda bismuth mixture to at one time explode in the patient's pocket, at another burst on the mantel-piece, while remaining quite quiescent on a third. I am old-fashioned enough to hold that the dispenser who goes out of his way to silver-coat or varnish pills without express directions from the prescriber is deserving of the latter's censure. A little insoluble talc is all that he has a right to use.

If he must be elegant, then, in common fairness to the succeeding ones and to the patient, let him mark his addition or divergence on the latter's property—the prescription.

The universal use of aq. dest. is a very important point. With respect to new apparatus and methods of dispensing the advice of Pope will appear rational to most of us.

> Be not the first by whom the new are tryed,
> Nor yet the last to lay the old aside.

Which I take it means, when translated into pharmaceutical language, that on visiting M. or N.'s pharmacy, though not expecting

to find the latest thing in torsion balances, one would be mildly contemptuous of a libration performed with that antiquated instrument you hold up by a tuft.

Nor could one fail to be a little aghast at the acumen of a proprietor who provides for his henchman no better vessel to melt cacao butter in than the ordinary covered pot.

In the foregoing remarks, necessarily highly condensed and discursive as they are, I trust that nothing may have occurred acrid or personal to any one present. I am simply keen for the credit and honour of pharmacy; to make its procedure and products uniform, and to place the dealings of pharmacists with other individuals and with the State on an unassailable basis.

A vote of thanks was passed to Mr. Doran.

The next paper was read by Mr. NAYLOR in the absence of the author.

NOTE ON THE PREPARATION OF HYDROBROMIC ACID.

BY E. M. MARSHALL, GLASGOW.

In preparing hydrobromic acid the process usually followed is that described by F. W. Fletcher at the York Conference in 1881. Briefly, the method consists in passing sulphuretted hydrogen gas into water containing bromine until the liquid is no longer red, and subsequent distillation of the hydrobromic acid from the sulphuric acid, the other product of the reaction.

Sulphuretted hydrogen is an extremely useful body to all classes of chemists, but when it makes its presence felt, difficulties arise, which are accentuated when the experiments are carried on in situations not specially suited to the purpose. This is very evident when the usual apparatus and facilities of the retail chemist are considered. He can with convenience prepare this gas for testing purposes when the quantities are small, but in dealing with pounds the question is different. The pressure necessary in forcing the gas through a large bulk of liquid is considerable, rendering the apparatus extremely liable to leakage, so much so that constant attention is necessary.

The excess of gas, not being absorbed in passing through the liquid, escapes into the air, or is only with difficulty prevented from doing so. Having converted a quantity of bromine into hydro-

bromic acid by this means, a small amount of a dark red liquid, sulphur bromide, is seen at the bottom of the vessel; if the sulphuretted hydrogen is allowed to pass directly into the bromine, 20 per cent. of the latter may be converted into the sulphur compound, but when passed into the liquid above the bromine none need be formed if care is exercised.

With a view to further investigating the properties of sulphur bromide, experiments were carried out, of which the following is a summary: Sulphur bromide was collected as a bye product from Fletcher's process, and, in order to obtain it pure, a quantity was distilled. Bromine comes over, the temperature rising steadily until the thermometer registers 195° to 200° C., when it remains at this point for a time; sulphur now becomes evident, and the temperature rising rapidly the latter body is left in the retort. The fraction distilling between 195° and 200° C. may be taken as pure sulphur bromide. Its specific gravity is 2·4, bromine having a gravity of 3·18; the fumes given off at ordinary temperatures smell somewhat sulphurous, and to show the loose state of combination between the two elements, blowing a current of air through the liquid is sufficient to entirely decompose it, bromine being removed. Sulphur and bromine dissolve in it, approximating in each instance towards the properties of the element in excess. The body can be made most conveniently by adding sulphur in the proportion of two parts to five parts by weight of bromine, a small amount of heat being evolved during the combination. Its colour, a beautiful red, soon becomes dull when water is added, owing to the precipitation of sulphur; the reaction when studied is found to be most interesting. On shaking a mixture of sulphur bromide and water heat is evolved and hydrobromic acid formed.

$$5Br_2S_2 + 6H_2O = 10HBr + H_2SO_4 + SO_2 + 4S_2.$$

A little thiosulphuric acid is formed at this point when the solution is weak in acid, but on the strength increasing it is decomposed.

$$2H_2S_2O_3 + 2H_2O + 2S_2Br_2 = 2H_2SO_4 + 4HBr + 3S_2.$$

The sulphur dioxide from the first reaction acting with the water forms a further quantity of hydrobromic acid:—

$$SO_2 + S_2Br_2 + 2H_2O = 2HBr + H_2SO_4 + S_2,$$

but perhaps the reaction which is of greatest interest among the number is that in which H_2S is evolved, although it is only in small quantity:—

$$2H_2SO_4 + Br_2S_2 = H_2S + 2HBr + 4SO_2.$$

More sulphur bromide is now acted upon by the sulphuretted hydrogen and sulphur dioxide :—

$$H_2S + 4S_2Br_2 + H_2O = 8HBr + H_2SO_4 + 4S_2,$$

and also

$$2H_2S + 2S_2Br_2 = 4HBr + 3S_2.$$

These changes are accompanied by a considerable rise in temperature, which may have to be controlled by the addition of a little cold water or cooling the exterior of the vessel. No effervescence occurs during any period of the reaction, so that the fumes given off are necessarily at a minimum.

The sulphur thrown out by the reaction dissolves in the sulphur bromide, rendering the conversion of the last of the bromine into hydrobromic acid rather slow, the water having some difficulty in penetrating the plastic mass now remaining, but on standing for a short time it becomes solid enough to be broken up, when the reaction soon finishes.

Sulphur, as will be noticed, is largely present throughout the process, and naturally one wishes to know if bromine in excess facilitates the production of hydrobromic acid. With this end in view, and with the aim of simplifying the process of manufacturing hydrobromic acid, so that all interested in that substance might be able, if they so desired, to distil it for themselves, numerous experiments were undertaken in order to work out a formula based on the foregoing reactions, which would give good results in practice, and would at the same time obviate the difficulties at present experienced in making the acid.

A small amount of hydrobromic acid is first made by means of sulphur bromide and water; the acid liquid is poured off from the sulphur into a suitable vessel and bromine added, preferably from a separating funnel delivering below the surface of the liquid. The bromine dissolves, it being very soluble in this acid. The liquid is stirred or otherwise agitated, and a very small amount of sublimed sulphur added; combination at once takes place, and the liquid becomes clear.

$$3Br_2 + S + 4H_2O = 6HBr + H_2SO_4.$$

More bromine is now added and the agitation continued, sulphur being added when the liquid shows the presence of free bromine.

The action goes on rapidly until the liquid has a specific gravity about 1·61, when an equilibrium is maintained between the

sulphuric and hydrobromic acids, the process tending to work backward, and give rise to free bromine and SO_2.

$$2HBr + H_2SO_4 = Br_2 + SO_2 + 2H_2O.$$

The liquid is now distilled in the usual way, but as one distillation is not sufficient to free the hydrobromic acid from traces of sulphuric acid, a second distillation renders it pure, colourless, and capable of keeping in 40 per cent. solution, which on dilution 1 to 3 forms the acid of the B.P. Care should be taken that no sulphur bromide enters the distillation flask, otherwise free sulphur will distil and contaminate the hydrobromic acid with sulphurous and sulphuric acids. A small amount of the acid is kept back in the generating vessel, and the original operation repeated.

Experiments prove that one ounce of sulphur is capable of converting over 17 ozs. of bromine into hydrobromic acid. Reckoning the acid as 40 per cent. it constitutes a little over 90 per cent. of the bulk of the liquid formed, about 9 per cent. being sulphuric acid, from which the former is separated by distillation.

The experiments in connection with this paper were carried out in the laboratories of Brown Brothers and Co., Glasgow, to whom thanks are due.

The PRESIDENT said he would accept Mr. Naylor's statement that this method was an improvement, and would therefore propose a hearty vote of thanks to the author.

Dr. ATTFIELD said if Mr. Marshall had not already stated it he trusted he would let them know how the improved hydrogen sulphide and bromine process compared with what he thought was the more common method, namely, the action of sulphuric acid on potassium bromide in the presence of water.

Mr. TYRER said neither the process mentioned by Mr. Naylor, nor that mentioned by Dr. Attfield, was in common use. He thought there were elements of workability about Mr. Marshall's process.

Dr. ATTFIELD asked if Mr. Tyrer would mention what was the method commonly employed by manufacturers.

Mr. TYRER said he had no hesitation in mentioning a common process, that of passing sulphurous acid gas into bromine and water. The reactions were quite simple.

Mr. THOS. MABEN said Mr. Marshall, who had prepared this

paper at his request, was quite aware that there were other processes employed in addition to passing H_2S through bromine, one of which was that just mentioned by Mr. Tyrer. In that way they obtained hydrobromic acid without the disadvantages of having in the laboratory sulphuretted hydrogen vapours, which, of course, were very injurious to bismuth and other metals.

A hearty vote of thanks was passed to Mr. Marshall for his paper.

The last paper was on :—

AN IMPROVEMENT ON THE B.P. SANTONIN TEST.

By Percy Pain, Ph.Ch.

The B.P. test for santonin is : "Added to warm alcoholic solution of potassium hydroxide it yields a violet red colour." As many other substances give a similar reaction, and a comparatively large amount of santonin is required to produce any decisive colour, I have attempted to render the test more certain and sensitive.

The fact of an alcoholic solution of santonin being so intensely bitter compared with an aqueous solution seemed to point to some molecular change having taken place, and this led me to experiment with other ethyl compounds.

I obtained the best results with ethyl nitrite in the form of the B.P. solution. A few crystals of santonin warmed in a test-tube with 2 or 3 c.c. of solution of ethyl nitrite gives a fine rose-red colour on the addition of a few drops of solution of potassium hydroxide.

No colour is produced until the addition of the potash solution, and this serves to distinguish it from such bodies as aloin and resorcin—both of which give a red colour with solution of ethyl nitrite, intensified on the addition of potash solution—whilst thymol with the same test yields a dark yellow solution.

One milligramme of santonin gives no perceptible coloration treated as described in the Pharmacopœia, but is recognisable by this ethyl nitrite test.

A vote of thanks was passed to the author.

GENERAL BUSINESS.

Presentation from the Bell and Hills Fund.

The PRESIDENT then presented to Mr. Beggs, as President of the Pharmaceutical Society of Ireland, the usual gift of books from the Bell and Hills Fund.

Mr. BEGGS said he accepted the books with feelings of very deep gratitude. They would be placed in their library, and would be accessible to all their students.

The Formulary Committee.

Mr. WARDLEWORTH proposed that the following gentlemen constitute the Formulary Committee for the ensuing year:—Messrs. N. H. Martin, W. A. H. Naylor, A. C. Abraham, F. C. J. Bird, Peter Boa, W. Martindale, F. Ransom, Dr. Symes, Harold Wilson, R. Wright, H. Wilson, and W. F. Wells.

Dr. MCWALTER seconded the proposition. He said that hitherto they had had no representative from Ireland on this Committee, but he was glad to say that that omission had been filled by the introduction of Mr. W. F. Wells.

The motion passed unanimously.

Place of Meeting for 1902.

Mr. CHAS. KERR (Dundee) then invited the Conference to visit Dundee next year. He said it was thirty-four years since the Conference last met in Dundee, and the members, if the invitation were accepted, would be struck by the great improvement that had taken place in the city since that time.

Mr. NASMYTH (Arbroath) supported the invitation. As representing the Forfarshire Association, he could say that it would give them the greatest pleasure if the next Conference met at Dundee. In his county they had one hundred chemists, sixty of whom were members of their Association, and they were not only loyal to themselves, but they were loyal to the Pharmaceutical Society of Great Britain.

Mr. JOHN C. UMNEY moved that the invitation be accepted, and he hoped it would be very largely availed of by their Irish friends.

Sir THOMAS ROBINSON seconded the proposal and the motion was unanimously agreed to.

Election of officers for 1901–1902.

The following officers were proposed for election for the ensuing year:—

President.—G. C. Druce, M.A., F.L.S., Oxford.

Vice-Presidents.—G. W. T. Newsholme, F.C.S., Sheffield; G. D. Beggs, M.P.S.I., Dalkey; Chas. Kerr, Dundee: W. A. H. Naylor, F.I.C., F.C.S., London.

Treasurer.—John C. Umney, F.C.S., London.

Hon. General Secretaries.—F. Ransom, F.C.S., Hitchin; E. Saville Peck, M.A., Cambridge.

Hon. Local Secretary.—W. Cummings, Dundee.

Other Members of the Executive Committee.—Leo Atkinson, London; H. Collier, London; E. H. Farr, F.C.S., Uckfield; C. T. Tyrer, F.C.S., London; W. F. Wells, Dublin; J. I. Bernard, Dublin; Professor Greenish, F.I.C., F.L.S., London; Andrew Nasmyth, Arbroath; Edmund White, B.Sc., London.

Auditors.—G. H. Grindley, Dublin; James Russell, Dundee.

The PRESIDENT put the motion to the meeting, and it was carried with acclamation.

Mr. Naylor's Retirement.

Mr. MARTIN then proposed the following resolution: "That the British Pharmaceutical Conference regrets to find that through a combination of ill-health and irresistible claims on his time in other directions, Mr. Naylor has been obliged to tender his resignation as senior Hon. Secretary of the Conference, and the members offer their deepest thanks to him for his long and valuable services." They all knew that the smooth working of the British Constitution was due very largely to the permanence of the Civil Service, and the Conference had been peculiarly fortunate in the matter of its permanent officials. Since the formation of the Conference, thirty-eight years ago, it had had eight secretaries, of whom two had covered thirty-two years. Three very distinguished men, acting on the suggestion of Mr. Schacht, founded the Conference at Newcastle, viz. Henry Brady, Richard Reynolds, and John Attfield, and the latter, whom they were all so glad to see still amongst them, acted for seventeen years as Hon. Secretary, and did yeoman's service. Its organizations, early success, and the permanent basis of its constitution were due entirely to those three men, and not the least to Dr. Attfield. Another distinguished phar-

macist who followed was Mr. Benger, whose resignation they all deplored. Dr. Thresh was another Hon. Secretary, and he need not refer to Mr. Ransom, who had already served eleven years, and had fitted himself so well to take up the reins which Mr. Naylor was relinquishing. It would have been a great grief to him to have had to propose this resolution if it had not been for the fact that he knew that matters would be safe in the hands of Mr. Ransom, who would be ably assisted by Mr. Peck. He could not in the few minutes at his disposal give anything like an adequate idea of the character of Mr. Naylor. He had had the honour of being President for two years, and had worked with him on the Formulary Committee for fifteen years, and he knew what an indefatigable worker he was, and with what urbanity, courtesy, and zeal he carried on all the scientific work of the Conference. If Mr. Naylor were not there he might say a great deal more, but he should find it difficult to exaggerate in speaking of him. He was the most unselfish pharmacist he knew. The intimate knowledge which he possessed of pharmacy was always available in the most open and cordial manner. There was no *arrière pensée*, he always assisted out of the depths of his knowledge to the utmost of his ability. He had always been loyal to the principles and constitution of the Conference, and had never allowed it to be diverted to extraneous objects, or to coquette with political or commercial questions, which would have only exerted a disintegrating influence. In submitting this resolution, he was pleased to think that they were not losing Mr. Naylor altogether; he would still be Vice-President, and some day, he hoped, President, and he believed the general appreciation of his services would shortly crystallize into a tangible form.

Dr. Attfield, in seconding the motion, said they had all seen how extremely important were the services of the Hon. Secretaries, and at every meeting it was the same. At any rate, for the last fifteen years the organization of the Conference had depended more largely on Mr. Naylor than on his colleague, and as to the intervals between the meetings, of which the members could know but little, he might say that the obvious labours of Mr. Naylor were but as the visible capitals to the invisible columns which represented his labours during the intervals. He cordially supported the resolution, knowing as he did that none of Mr. Naylor's predecessors had served the Conference better; but he was glad to know that in Mr. Ransom they had an able successor, and he was also assured that in Mr. Peck they would have a worthy assistant.

The PRESIDENT, in putting the resolution, said the Conference had had rather a rough time during the past year. First they lost the editor of the *Year-Book* through ill-health, and when the contemplated resignation of Mr. Naylor was first mentioned it came upon him like a shock, and he even doubted for a time whether the barque could be steered again into untroubled waters. As Mr. Martin and Dr. Attfield had said, the various qualities which Mr. Naylor had brought to bear during the long time he had held office, only those who were in close contact with him could fully realise. The main thought which occurred to him was his unselfish character. The one thing in Mr. Naylor's mind was the success of the Conference, and that, after all, was the true test of a secretary; he must put his society first, and everything else afterwards. Mr. Naylor had had to work with various disintegrating forces about him, which had not tended to lighten his labours, but he hoped his successors would have an easier task. He did not think that, great as Mr. Naylor's services had been, they need fear for the future. He could not help feeling that the Conference was in a firmer position than it had been; that it had a greater hold on the members, who realized better perhaps than before that the yearly meeting was the vantage ground from which they could gain better ideas of pharmacy, of the world at large, and of each other. It was a bond of brotherhood, which united pharmacy in its widest sense; and for that reason it was the duty of every member to work for it, and try to enlarge its membership. For the work Mr. Naylor had done they were all deeply grateful.

The resolution having been carried amidst loud cheers—

Mr. W. A. H. NAYLOR said it was a great pleasure and a great help to him to know that they received his resignation so joyously. He had the intimation given him that this might be a time for tears, and certainly if it had been it would have been quite impossible for him to control his emotion. It was impossible to thank them adequately—to try to do so would simply beggar the language of an angel—for all the kind sentiments which they had expressed to him to-day, for the countless acts of favour, for the measureless confidence that they had reposed in him year after year for a prolonged period, and for the unfailing sympathy and support which had ever been accorded him. For these things he thanked them most sincerely and most heartily. It was under the transfiguring influences of these kindnesses that in whatever services he had rendered he had been able to lose the duty in the joy. He did this day before them remember his faults, and they had been pleased to

throw over them the cover of a large forgetfulness, and for that he was doubly grateful. He did not wish to claim credit for himself. The secretaryship had been a joint one, and no man could have been blessed with a more genial, more considerate, loyal, business-like, and long-suffering colleague than he had in Mr. Ransom. And when his heart had failed, and Mr. Ransom himself had been depressed, then the inspiring spirit and the bright, sunny face and smile of Mrs. Ransom had cheered them. He thanked them most heartily.

Votes of Thanks.

Mr. Rutherford Hill then proposed that a cordial vote of thanks be accorded to Mr. Wells, the Chairman; Mr. Boyd, Vice-Chairman; Mr. Beggs, the Hon. Treasurer; Mr. Bernard, the Hon. Local Secretary, and the other members of the Local Committee for their most successful efforts in organizing the present meeting. Referring to the hearty welcome given to the members, he said that he had the authority of London members in saying that Dublin was not the second city of the Empire, but the first, in hospitality.

Mr. Gadd (Exeter) seconded the motion, which was carried with acclamation.

Mr. Wells, acknowledging the vote, said he felt quite overcome at the way in which the vote had been given. Although there was a good deal of trouble in arranging for such a meeting, there was a good deal of compensation. He expressed his appreciation of the way in which the members of the committee had helped in all the work.

Mr. Bernard, responding to the calls for him, said he supposed the reason he was thanked was that he had not inflicted speeches upon them.

Mr. Beggs also spoke two graphic sentences of thanks.

On the motion of Mr. Brodie, seconded by Mr. Pidd, a cordial vote of thanks was accorded to the President and Council of the Royal Society of Dublin and Mr. Moss for all that had been done for the comfort of the Conference.

Mr. R. J. Moss, briefly acknowledging the vote, said he hoped the Conference would come back again at a shorter interval than a quarter of a century.

Mr. Cooper (London) moved that a hearty vote of thanks be

accorded to the Lord Mayor for having so kindly placed the Mansion House at the disposal of the Conference for the luncheons.

Mr. KEMP seconded the proposition, which was unanimously carried.

Mr. MABEN then proposed, "That the best thanks of the Conference be accorded to the Vice-president of the Department of Agriculture and Technical instruction, and to Colonel Plunkett, the Director of the Science and Art Museum, for their kindness in granting the use of the Museum for the Reception and Conversazione."

The motion, having been duly seconded, was carried unanimously.

Dr. SYMES then moved that the heartiest thanks of the Conference be given to the President for the genial and felicitous manner in which he had conducted the business of the Conference.

Mr. PAYNE seconded the vote.

The motion passed unanimously.

The PRESIDENT briefly returned thanks, and the proceedings then terminated.

THE LUNCHEONS.

By the kind permission of the Lord Mayor of Dublin, the luncheons were held on the Tuesday and Wednesday, in the Rotunda, at the Mansion House, Mr. W. J. Wells, taking the chair, being supported on his right by the President of the Conference, and on his left, on the Wednesday, by Mr. Alderman Hennessey. The fare was excellent. The toasts were few, the speeches short and to the point.

THE RECEPTION AND CONVERSAZIONE.

This took place in the Science and Art Museum on Monday, July 29th.

The President, Mr. G. Claridge Druce, Mayor of Oxford, in Court dress and wearing his mayoral chain, stood in the vestibule, having on his right Mrs. Francis Ransom, Mrs. N. H. Martin, Mrs. Symes, Mrs. J. C. C. Payne, Mrs. W. F. Wells, and welcomed the guests, numbering over 400.

The Main Hall, where, amidst the many objects of interest, the old and new members of the Conference and their friends once

again greeted one another, soon presented a scene of much animation and great cordiality.

The musical programme, both vocal and instrumental, was excellent and well appreciated.

The band of the 4th Battalion of the Rifle Brigade played selections during the evening.

The gathering, successful in every way, dispersed shortly before eleven p.m.

EXCURSION TO DALKEY.

Tuesday afternoon's excursion to Dalkey was made on special electric cars, which left Merrion Square and passed through the townships of Blackrock and Kingstown, along the lovely road to Dalkey. Leaving the cars at the terminus, the company walked to Sorrento grounds, where, by permission of Lady Overend, tea was served. After a delightful tea, the company broke up into groups, some strolling round the beautiful grounds and some walking or driving to the summit of Victoria Hill, Killiney. From this eminence a magnificent view is obtained of the Wicklow Mountains, Bray Head, Little Sugar-loaf, and the entire sweep of Dublin Bay. In the evening the band of the 4th Battalion of the Rifle Brigade played a selection of music in Sorrento Park. Unfortunately the rain began to come down about 8.30, when the band was rendering some Irish airs which seemed all the more delightful on account of the environment, and soon the cars were rushed for.

THE CONCERTS.

The concerts were brilliant functions. In the Shelbourne Drawing-room Mrs. Wells presided, and the gathering gave the lie to decadence in pharmacy. The word should be *revenesco*, as so many charming and fashionably costumed women surely embody prosperity. Those who sang or played were Miss Grindley (the Ladies' Secretary), Miss Ethel Varian, Miss Gibson (Edinburgh), Miss Brien, Mrs. Brien, Mrs. Figgis Johnson, Mrs. Rait, Mr. Wells, Professor Tichborne, Mr. Church, and Mr. Currie. Mr. Thomas Tyrer and Mr. John Murray presided at the piano. At the smoking concert downstairs Mr. Beggs made a go-ahead chairman. There the ball was opened by Mr. Currie (Glasgow) with "A Wee Drappie o't," and Professor Tichborne followed with a 'cello solo; Mr. Vin-

cent McWalter, Dr. Walsh, Mr. Patrick Kelly, and others paved the way for a splendid duet by Miss Gibson and Mr. Wells; and later Mrs. Wright excelled herself in her rendering of "Similar Causes; or, Prehistoric History," which was à propos of the President's geology.

THE EXCURSION.

It was with every appearance of anticipated pleasure that some 250 members of the Conference and their friends assembled at Harcourt Street Station at nine a.m. on Thursday morning, August 1st.

A special train had been chartered for the occasion, and soon started on its journey along the shores of Dublin Bay, passing through Bray, Greystones, Wicklow, etc.

Rathnew was reached about 11.30 a.m., and here a long line of jaunting cars and brakes was in readiness. These rapidly filled, and after about three quarters of an hour the Devil's Glen was reached, through which the greater part of the company travelled on foot, being well repaid for their climb by the beauty of the wooded sides and the grandeur of the views.

The cars were then again entered, and the journey resumed to Glendalough—"the valley of the two lakes" and seven churches.

This charmingly situated little village was reached about 3 p.m.

Here an excellent luncheon was provided, in two large marquees behind the Royal Hotel.

The toasts included "The King," "The Ladies' Committee," "The President," and "The Local Secretary—Mr. Bernard."

The company then broke up into parties and dispersed, some to inspect the ruins of the seven churches and the quaint round tower, others to climb the steep mountain sides to get a more comprehensive view. Some wandered to the upper lake and were rowed out to St. Kevin's bed, being instructed *en route* by the boatmen upon several points in the folk-lore of the district; while others sat in groups and recalled the visit of some three-and-twenty years ago. Again, some hunted along the stream, hoping to meet with plants but seldom seen; while others with the ever present camera made permanent records of their long-to-be-remembered peep at Glendalough.

All found their way back to the marquees about 5.30 p.m., and enjoyed a most refreshing cup of tea.

Rain clouds were then evident: a rush was made for the brakes, and many were soon on their way towards the Vale of Clara. Happily it was but a shower, which laid the dust and freshened the air, making the drive to Rathdrum one of the pleasantest during the day. The latter place was left soon after nine p.m., and the journey homewards continued along the now moonlit shores until Dublin was reached about 10.30 p.m.

It had been a long day, much had been done, and all had been thoroughly enjoyed.

On Friday, August 2nd, those members of the Conference who had not dispersed were invited to visit the Fire Brigade Station, and many availed themselves of this opportunity. The turn-out of the fire-escape, recently invented by the captain, was a particularly smart performance both by men and horses. In the absence of the President the senior past President suggested cheers for the whole brigade, which were at once heartily given.

GARDEN PARTY AT THE ZOOLOGICAL GARDENS.

At the kind invitation of Mr. and Mrs. Samuel P. Boyd, a large party was hospitably entertained on Friday afternoon at the Zoological Gardens, Phœnix Park. The band of the 21st (Empress of India's) Lancers was present, under the direction of Mr. Alfred Light. The weather was perfect, the gardens were looking their best, and the gathering formed a very appropriate conclusion to a most successful meeting.

TABLES OF USEFUL INFORMATION FOR PHARMACISTS.

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CALENDAR FOR 1901.

JANUARY.					
S	...	6	13	20	27
M	...	7	14	21	28
Tu	1	8	15	22	29
W	2	9	16	23	30
Th	3	10	17	24	31
F	4	11	18	25	...
S	5	12	19	26	...

FEBRUARY.					
S	...	3	10	17	24
M	...	4	11	18	25
Tu	...	5	12	19	26
W	...	6	13	20	27
Th	...	7	14	21	28
F	1	8	15	22	...
S	2	9	16	23	...

MARCH.						
S	...	3	10	17	24	31
M	...	4	11	18	25	...
Tu	...	5	12	19	26	...
W	...	6	13	20	27	...
Th	...	7	14	21	28	...
F	1	8	15	22	29	...
S	2	9	16	23	30	...

APRIL.					
S	...	7	14	21	28
M	1	8	15	22	29
Tu	2	9	16	23	30
W	3	10	17	24	...
Th	4	11	18	25	...
F	5	12	19	26	...
S	6	13	20	27	...

MAY.					
S	...	5	12	19	26
M	...	6	13	20	27
Tu	...	7	14	21	28
W	1	8	15	22	29
Th	2	9	16	23	30
F	3	10	17	24	31
S	4	11	18	25	...

JUNE.						
S	...	2	9	16	23	30
M	...	3	10	17	24	...
Tu	...	4	11	18	25	...
W	...	5	12	19	26	...
Th	...	6	13	20	27	...
F	...	7	14	21	28	...
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JULY.					
S	...	7	14	21	28
M	1	8	15	22	29
Tu	2	9	16	23	30
W	3	10	17	24	31
Th	4	11	18	25	...
F	5	12	19	26	...
S	6	13	20	27	...

AUGUST.					
S	...	4	11	18	25
M	...	5	12	19	26
Tu	...	6	13	20	27
W	...	7	14	21	28
Th	1	8	15	22	29
F	2	9	16	23	30
S	3	10	17	24	31

SEPTEMBER.					
S	1	8	15	22	29
M	2	9	16	23	30
Tu	3	10	17	24	...
W	4	11	18	25	...
Th	5	12	19	26	...
F	6	13	20	27	...
S	7	14	21	28	...

OCTOBER.					
S	...	6	13	20	27
M	...	7	14	21	28
Tu	1	8	15	22	29
W	2	9	16	23	30
Th	3	10	17	24	31
F	4	11	18	25	...
S	5	12	19	26	...

NOVEMBER.					
S	...	3	10	17	24
M	...	4	11	18	25
Tu	...	5	12	19	26
W	...	6	13	20	27
Th	...	7	14	21	28
F	1	8	15	22	29
S	2	9	16	23	30

DECEMBER.					
S	1	8	15	22	29
M	2	9	16	23	30
Tu	3	10	17	24	31
W	4	11	18	25	...
Th	5	12	19	26	...
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S	7	14	21	28	...

CALENDAR FOR 1902.

JANUARY.					
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M	..	6	13	20	27
Tu	...	7	14	21	28
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FEBRUARY.					
S	...	2	9	16	23
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Tu	...	4	11	18	25
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MARCH.						
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W	3	10	17	24	31
Th	4	11	18	25	...
F	5	12	19	26	...
S	6	13	20	27	...

Average Limits of Specific Gravities of Tinctures, B.P., 1898.

Name of Tincture.	Specific Gravity at 15° C.
Tinct. Aconiti	·890– ·895
,, Aloes	·970– ·975
,, Arnicæ	·890– ·895
,, Asafetidæ	·910– ·915
,, Aurantii recentis	·875– ·885
,, Belladonnæ	·910– ·915
,, Benzoin Co.	·890– ·900
,, Buchu	·925– ·930
,, Calumbæ	·915 · ·920
,, Camphoræ Co.	·915– ·920
,, Cannabis Indicæ	·845– ·850
,, Cantharidis	·835 - ·840
,, Capsici	·890– ·895
,, Cardamomi Co.	·945– ·950
,, Cascarillæ	·895– ·900
,, Catechu	·975– ·980
,, Chiratæ	·920– ·925
,, Chloroform et Morphinæ Co.	1·010–1·015
,, Cimicifugæ	·925– ·930
,, Cinchonæ	·915– ·920
,, ,, Co.	·915– ·920
,, Cinnamomi	·900– ·905
,, Cocci	·950– ·955
,, Colchici Sem.	·950– ·955
,, Conii	·895– ·900
,, Croci	·925– ·930
,, Cubebæ	·840– ·845
,, Digitalis	·930– ·935
,, Ergotæ Ammon.	·930– ·935
,, Ferri Perchloridi	1·085–1·088
,, Gelsemii	·920– ·925
,, Gentianæ Co.	·965– ·970
,, Guaiaci Ammon.	·895– ·900
,, Hamamelidis	·947– ·952
,, Hydrastis	·920– ·925
,, Hyoscyami	·950– ·955
,, Iodi	·875– ·880
,, Jaborandi	·950– ·955
,, Jalapæ	·905– ·910

one gallon, or o

To face pa

Name of Tincture.	Specific Gravity at 15° C.
Tinct. Kino	·995–1·000
„ Krameriæ	·935– ·940
„ Lavandulæ Co.	835– ·840
„ Limonis	·875– ·885
„ Lobeliæ Ætheria	·815– ·820
„ Lupuli	·935– ·940
„ Myrrhæ	·845– ·855
„ Nucis Vomicæ	·910– ·915
„ Opii	·950– ·965
„ „ Ammon.	·895– ·900
„ Podophylli	·845– ·850
„ Pruni Virg.	·935– ·940
„ Pyrethri	·900– ·905
„ Quassiæ	·945– ·950
„ Quillaiæ	·920– ·925
„ Quininæ	·885– ·895
„ „ Ammon.	·925– ·930
„ Rhei Co.	·970– ·975
„ Scillæ	·960– ·970
„ Senegæ	·935– ·940
„ Sennæ Co.	·985– ·995
„ Serpentariæ	·895– ·900
„ Stramonii	·955– ·960
„ Strophanthi	·890– ·895
„ Sumbul	·900– ·905
„ Tolutanæ	·860– ·865
„ Valerianæ Ammon.	·940– ·945
„ Zingiberis	·840– ·845

Table for Conversion of Grains into Grams.

Grns.	Grms.	Grns.	Grms.	Grns.	Grms.	Grns.	Grms.
1	·0648	54	3·4991	103	6·6743	152	9·8494
2	·1296	55	3·5639	104	6·7391	153	9·9142
3	·1944	56	3·6287	105	6·8039	154	9·9790
4	·3240	57	3·6935	106	6·8687	155	10·0438
6	·3888	58	3·7583	107	6·9335	156	10·1086
7	·4536	59	3·8231	108	6·9983	157	10·1734
8	·5184	60	3·8879	109	7·0631	158	10·2382
10	·6480	61	3·9527	110	7·1279	159	10·3030
11	·7128	62	4·0175	111	7·1927	160	10·3678
12	·7776	63	4·0823	112	7·2575	161	10·4326
13	·8424	64	4·1471	113	7·3223	162	10·4974
15	·9720	65	4·2119	114	7·3871	163	10·5622
16	1·0368	66	4·2767	115	7·4519	164	10·6270
17	1·1016	67	4·3415	116	7·5177	165	10·6918
18	1·1664	68	4·4063	117	7·5815	166	10·7566
20	1·2960	69	4·4711	118	7·6463	167	10·8214
21	1·3608	70	4·5359	119	7·7111	168	10·8862
22	1·4256	71	4·6007	120	7·7759	169	10·9510
23	1·4904	72	4·6655	121	7·8407	170	11·0158
24	1·5552	73	4·7303	122	7·9055	171	11·0806
25	1·6200	74	4·7951	123	7·9703	172	11·1454
26	1·6848	75	4·8599	124	8·0351	173	11·2102
27	1·7496	76	4·9247	125	8 0999	174	11·2750
28	1·8144	77	4·9895	126	8·1647	175	11·3398
29	1·8792	78	5·0543	127	8·2295	176	11·4046
30	1·9440	79	5·1191	128	8·2943	177	11·4694
31	2·0088	80	5·1839	129	8·3591	178	11·5342
32	2·0736	81	5·2487	130	8·4239	179	11·5990
33	2·1384	82	5·3135	131	8·4887	180	11·6638
34	2·2032	83	5·3783	132	8·5536	181	11·7286
35	2·2680	84	5·4431	133	8·6183	182	11·7934
36	2·3328	85	5·5079	134	8·6831	183	11·8582
37	2·3976	86	5·5727	135	8 7479	184	11·9230
38	2·4624	87	5·6375	136	8·8127	185	11·9878
39	2·5272	88	5·7023	137	8·8775	186	12·0526
40	2·5920	89	5·7671	138	8·9422	187	12·1174
41	2·6568	90	5·8319	139	9·0070	188	12·1822
42	2·7215	91	5·8967	140	9·0718	189	12·2470
43	2·7863	92	5·9615	141	9·1366	190	12·3118
44	2·8511	93	6·0263	142	9·2104	200	12·9598
45	2·9159	94	6·0911	143	9·2662	250	16·1997
46	2·9807	95	6·1559	144	9·3310	300	19·4397
47	3·0455	96	6·2207	145	9·3958	400	25·9196
48	3·1103	97	6·2855	146	9·4606	500	32·3995
49	3·1751	98	6·3503	147	9·5254	600	38·8794
50	3·2399	99	6·4151	148	9·5902	700	45·3593
51	3·3047	100	6·4799	149	9 6550	800	51·8392
52	3·3695	101	6·5447	150	9·7198	900	58·3190
53	3·4343	102	6·6095	151	9·7846	1000	64·7989

Conversion of Thermometric Scales.

Table I.

Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.
400	204·4	348	175·6	296	146·7	244	117·8
399	203·9	347	175·0	295	146·1	243	117·2
398	203·3	346	174·4	294	145·6	242	116·7
397	202·8	345	173·9	293	145·0	241	116·1
396	202·2	344	173·3	292	144·4	240	115·6
395	201·7	343	172·8	291	143·9	239	115·0
394	201·1	342	172·2	290	143·3	238	114·4
393	200·6	341	171·7	289	142·8	237	113·9
392	200·0	340	171·1	288	142·2	236	113·3
391	199·4	339	170·6	287	141·7	235	112·8
390	198·9	338	170·0	286	141·1	234	112·2
389	198·3	337	169·4	285	140·6	233	111·7
388	197·8	336	168·9	284	140·0	232	111·1
387	197·2	335	168·3	283	139·4	231	110·6
386	196·7	334	167·8	282	138·9	230	110·0
385	196·1	333	167·2	281	138·3	229	109·4
384	195·6	332	166·7	280	137·8	228	108·9
383	195·0	331	166·1	279	137·2	227	108·3
382	194·4	330	165·6	278	136·7	226	107·8
381	193·9	329	165·0	277	136·1	225	107·2
380	193·3	328	164·4	276	135·6	224	106·7
379	192·8	327	163·9	275	135·0	223	106·1
378	192·2	326	163·3	274	134·4	222	105·6
377	191·7	325	162·8	273	133·9	221	105·0
376	191·1	324	162·2	272	133·3	220	104·4
375	190·6	323	161·7	271	132·8	219	103·9
374	190·0	322	161·1	270	132·2	218	103·3
373	189·4	321	160·6	269	131·7	217	102·8
372	188·9	320	160·0	268	131·1	216	102·2
371	188·3	319	159·4	267	130·6	215	101·7
370	187·8	318	158·9	266	130·0	214	101·1
369	187·2	317	158·3	265	129·4	213	100·6
368	186·7	316	157·8	264	128·9	212	100·0
367	186·1	315	157·2	263	128·3	211	99·4
366	185·6	314	156·7	262	127·8	210	98·9
365	185·0	313	156·1	261	127·2	209	98·3
364	184·4	312	155·6	260	126·7	208	87·9
363	183·9	311	155·0	259	126·1	207	97·2
362	183·3	310	154·4	258	125·6	206	96·7
361	182·8	309	153·9	257	125·0	205	96·1
360	182·2	308	153·3	256	124·4	204	95·6
359	181·7	307	152·8	255	123·9	203	95·0
358	181·1	306	152·2	254	123·3	202	94·4
357	180·6	305	151·7	253	122·8	201	93·9
356	180·0	304	151·1	252	122·2	200	93·3
355	179·4	303	150·6	251	121·7	199	92·8
354	178·9	302	150·0	250	121·1	198	92·2
353	178·3	301	149·4	249	120·6	197	91·7
352	177·8	300	148·9	248	120·0	196	91·1
351	177·2	299	148·3	247	119·4	195	90·6
350	176·7	298	147·8	246	118·9	194	90·0
349	176·1	297	147·2	245	118·3	193	89·4

CONVERSION OF THERMOMETRIC SCALES (*continued*).

Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.
192	88·9	136	57·8	80	26·7	24	4 4
191	88·3	135	57·2	79	26·1	23	5 0
190	87·8	134	56·7	78	25·6	22	5 6
189	87·2	133	56·1	77	25·0	21	6·1
188	86·7	132	55·6	76	24 4	20	6·7
187	86·1	131	55·0	75	23 9	19	7·2
186	85·6	130	54·4	74	23·3	18	7·8
185	85·0	129	53·9	73	22·8	17	8·3
184	84·4	128	53 3	72	22·2	16	8·9
183	83·9	127	52·8	71	21·7	15	9·5
182	83·3	126	52·2	70	21·1	14	10·0
181	82·8	125	51·7	69	20·6	13	10·6
180	82·2	124	51·1	68	20·0	12	11·1
179	81·7	123	50·6	67	19·4	11	11·7
178	81·1	122	50·0	66	18·9	10	12 2
177	80·6	121	49·4	65	18·3	9	12·8
176	80·0	120	48·9	64	17·8	8	13·3
175	79·4	119	48·3	63	17·2	7	13·9
174	78·9	118	47·8	62	16·7	6	14·4
173	78·3	117	47·2	61	16·1	5	15 0
172	77·8	116	46·7	60	15·6	4	15·6
171	77·2	115	46·1	59	15·0	3	16·1
170	76·7	114	45·6	58	14·4	2	16·7
169	76·1	113	45·0	57	13·9	1	17·2
168	75·6	112	44·4	56	13·3	0	17·8
167	75·0	111	43·9	55	12·8	1	18·3
166	74·4	110	43·3	54	12·2	2	18·9
165	73·9	109	42·8	53	11·7	3	19·4
164	73·3	108	42·2	52	11·1	4	20 0
163	72·8	107	41·7	51	10·6	5	20·6
162	72·2	106	41·1	50	10·0	6	21·1
161	71·7	105	40·6	49	9·4	7	21·7
160	71·1	104	40·0	48	8·9	8	22·2
159	70·6	103	39·4	47	8·3	9	22·8
158	70·0	102	38·9	46	7·8	10	23·3
157	69·4	101	38·3	45	7·2	11	23·9
156	68·9	100	37·8	44	6·7	12	24·4
155	68·3	99	37·2	43	6·1	13	25·0
154	67·8	98	36·7	42	5·6	14	25·6
153	67·2	97	36·1	41	5·0	15	26·1
152	66·7	96	35·6	40	4·4	16	26·7
151	66·1	95	35·0	39	3·9	17	27·2
150	65·6	94	34·4	38	3·3	18	27·8
149	65·0	93	33·9	37	2·8	19	28·3
148	64·4	92	33·3	36	2·2	20	28·9
147	63·9	91	32·8	35	1·7	21	29·4
146	63·3	90	32·2	34	1·1	22	30·0
145	62·8	89	31·7	33	0·6	23	30·6
144	62·2	88	31·1	32	0·0	24	31·1
143	61·7	87	30·6	31	0 6	25	31·7
142	61·1	86	30·0	30	1·1	26	32·2
141	60·6	85	29 4	29	1·7	27	32·8
140	60·0	84	28·9	28	2·2	28	33·3
139	59·4	83	28·3	27	2·8	29	33·9
138	58·9	82	27·8	26	3·3	30	34·4
137	58·3	81	27·2	25	3·9	31	35·0

Table showing the Value of 1 lb. and 1 cwt. in English Money when the Article is Quoted per Kilo in Francs.

If 1 kilo costs		1 lb. will cost			1 cwt. will cost			If 1 kilo costs		1 lb. will cost			1 cwt. will cost		
Fr.	cts.	£	s.	d.	£	s.	d.	Fr.	cts.	£	s.	d.	£	s.	d.
–	5	–	–	–¼	–	2	0½	2	50	–	–	10⅞	5	1	7¼
–	10	–	–	–½	–	4	0¾	2	55	–	–	11⅛	5	3	7¾
–	15	–	–	–⅝	–	6	1¼	2	60	–	–	11⅜	5	5	8
–	20	–	–	–⅞	–	8	1½	2	65	–	–	11½	5	7	8½
–	25	–	–	1⅛	–	10	2	2	70	–	–	11¾	5	9	8¾
–	30	–	–	1⅜	–	12	2½	2	75	–	1	0	5	11	9
–	35	–	–	1½	–	14	2¾	2	80	–	1	0¼	5	13	9½
–	40	–	–	1¾	–	16	3	2	85	–	1	0⅜	5	15	9¾
–	45	–	–	2	–	18	3¼	2	90	–	1	0⅝	5	17	10¼
–	50	–	–	2¼	1	0	3¾	2	95	–	1	0⅞	5	19	10¾
–	55	–	–	2⅜	1	2	4¼	3	0	–	1	1⅛	6	1	11¼
–	60	–	–	2⅝	1	4	4½	3	5	–	1	1¼	6	3	11½
–	65	–	–	2⅞	1	6	5	3	10	–	1	1½	6	5	11¾
–	70	–	–	3⅛	1	8	5	3	15	–	1	1¾	6	8	0¼
–	75	–	–	3¼	1	10	5¾	3	20	–	1	1⅞	6	10	0¾
–	80	–	–	3½	1	12	6¼	3	25	–	1	2⅛	6	12	1
–	85	–	–	3¾	1	14	6½	3	30	–	1	2⅜	6	14	1½
–	90	–	–	3⅞	1	16	7	3	35	–	1	2⅝	6	16	1¾
–	95	–	–	4⅛	1	18	7¼	3	40	–	1	2¾	6	18	2¼
1	0	–	–	4⅜	2	0	7¾	3	45	–	1	3	7	0	2¾
1	5	–	–	4⅝	2	2	8¼	3	50	–	1	3¼	7	2	3
1	10	–	–	4¾	2	4	8½	3	55	–	1	3½	7	4	3¼
1	15	–	–	5	2	6	8¾	3	60	–	1	3⅝	7	6	3½
1	20	–	–	5¼	2	8	9	3	65	–	1	3⅞	7	8	4
1	25	–	–	5½	2	10	9½	3	70	–	1	4⅛	7	10	4½
1	30	–	–	5⅝	2	12	10	3	75	–	1	4⅜	7	12	4¾
1	35	–	–	5⅞	2	14	10¼	3	80	–	1	4½	7	14	5¼
1	40	–	–	6⅛	2	16	10¾	3	85	–	1	4¾	7	16	5½
1	45	–	–	6⅜	2	18	11	3	90	–	1	5	7	18	6
1	50	–	–	6½	3	0	11½	3	95	–	1	5¼	8	0	6½
1	55	–	–	6¾	3	3	0	4	0	–	1	5⅜	8	2	7
1	60	–	–	7	3	5	0¼	4	5	–	1	5⅝	8	4	7½
1	65	–	–	7¼	3	7	0¾	4	10	–	1	5⅞	8	6	7¾
1	70	–	–	7⅜	3	9	1	4	15	–	1	6⅛	8	8	8
1	75	–	–	7⅝	3	11	1½	4	20	–	1	6¼	8	10	8½
1	80	–	–	7⅞	3	13	2	4	25	–	1	6½	8	12	8¾
1	85	–	–	8½	3	15	2¼	4	30	–	1	6¾	8	14	9
1	90	–	–	8¼	3	17	2¾	4	35	–	1	6⅞	8	16	9½
1	95	–	–	8½	3	19	3	4	40	–	1	7⅛	8	18	9¾
2	0	–	–	8¾	4	1	3¼	4	45	–	1	7⅜	9	0	10¼
2	5	–	–	8⅞	4	3	3¾	4	50	–	1	7⅝	9	2	10½
2	10	–	–	9⅛	4	5	4	4	55	–	1	7¾	9	4	11
2	15	–	–	9⅜	4	7	4¼	4	60	–	1	8	9	6	11½
2	20	–	–	9⅝	4	9	4¾	4	65	–	1	8¼	9	8	11¾
2	25	–	–	9¾	4	11	5¼	4	70	–	1	8½	9	11	0¼
2	30	–	–	10	4	13	5¾	4	75	–	1	8⅜	9	13	0½
2	35	–	–	10¼	4	15	6	4	80	–	1	8⅞	9	15	1
2	40	–	–	10½	4	17	6½	4	85	–	1	9⅛	9	17	1½
2	45	–	–	10⅝	4	19	7	4	90	–	1	9⅜	9	19	1¾

TABLE SHOWING THE VALUE OF 1 LB. AND 1 CWT. IN ENGLISH MONEY WHEN THE ARTICLE IS QUOTED PER KILO IN FRANCS (*continued*).

If 1 kilo costs		1 lb. will cost			1 cwt. will cost		
Fr.	cts.	£	s.	d.	£	s.	d.
4	95	–	1	9½	10	1	2¼
5	0	–	1	9¾	10	3	2½
5	10	–	1	10¼	10	7	3¼
5	20	–	1	10⅝	10	11	4
5	30	–	1	11⅛	10	15	4¾
5	40	–	1	11½	10	19	5½
5	50	–	1	11⅞	11	3	6¼
5	60	–	2	0⅜	11	7	7¼
5	70	–	2	0¾	11	11	8
5	80	–	2	1¼	11	15	8¾
5	90	–	2	1⅝	11	19	9¼
6	0	–	2	2⅛	12	3	10¼
6	10	–	2	2½	12	7	11
6	20	–	2	3	12	11	11¾
6	30	–	2	3⅜	12	16	0½
6	40	–	2	3⅞	13	0	1¼
6	50	–	2	4¼	13	4	2¼
6	60	–	2	4¾	13	8	2¾
6	70	–	2	5⅛	13	12	3½
6	80	–	2	5⅝	13	16	4¼
6	90	–	2	6	14	0	5
7	0	–	2	6½	14	4	6
7	10	–	2	6⅞	14	8	6¾
7	20	–	2	7⅜	14	12	7½
7	30	–	2	7¾	14	16	8¼
7	40	–	2	8¼	15	0	9
7	50	–	2	8⅝	15	4	9¾
7	60	–	2	9⅛	15	8	10½
7	70	–	2	9½	15	12	11¼
7	80	–	2	9⅞	15	17	0¼
7	90	–	2	10⅜	16	1	0¾
8	0	–	2	10¾	16	5	1¾
8	10	–	2	11¼	16	9	2½
8	20	–	2	11⅜	16	13	3
8	30	–	3	0⅛	16	17	3¾
8	40	–	3	0½	17	1	4¾
8	50	–	3	1	17	5	5½
8	60	–	3	1⅜	17	9	6¼
8	70	–	3	1⅞	17	13	7

If 1 kilo costs		1 lb. will cost			1 cwt. will cost		
Fr.	cts.	£	s.	d.	£	s.	d.
8	80	–	3	2¼	17	17	7¾
8	90	–	3	2¾	18	1	8¾
9	0	–	3	3⅛	18	5	9¼
9	10	–	3	3⅝	18	9	10
9	20	–	3	4	18	13	10¾
9	30	–	3	4½	18	17	11½
9	40	–	3	4⅞	19	2	0½
9	50	–	3	5⅜	19	6	1¼
9	60	–	3	5¾	19	10	2
9	70	–	3	6¼	19	14	2¾
9	80	–	3	6⅝	19	18	3¼
9	90	–	3	7⅛	20	2	4¼
10	–	–	3	7½	20	6	5
11	–	–	3	11⅞	22	7	0¾
12	–	–	4	4¼	24	7	8½
13	–	–	4	8⅝	26	8	4
14	–	–	5	1	28	9	0
15	–	–	5	5¼	30	9	7½
16	–	–	5	9⅝	32	10	3¼
17	–	–	6	2	34	10	11
18	–	–	6	6⅜	36	11	6½
19	–	–	6	10¾	38	12	2¼
20	–	–	7	3	40	12	10
30	–	–	10	10⅝	60	19	3
40	–	–	14	6⅛	81	5	8
50	–	–	18	1¾	101	12	1
60	–	1	1	9¼	121	18	6
70	–	1	5	4¾	142	4	11
80	–	1	9	0⅜	162	11	4
90	–	1	12	7⅞	182	17	9
100	–	1	16	3½	203	4	2
200	–	3	12	7	406	8	4
300	–	5	8	10¼	609	12	7
400	–	7	5	1¾	812	16	9
500	–	9	1	5¼	1016	0	11
600	–	10	17	8¾	1219	5	2
700	–	12	14	0	1422	9	4
1000	–	18	2	10½	2032	1	11

TABLE SHOWING EQUIVALENT RATES PER LB. AND CWT.

Per lb.	Per cwt.		Per lb.	Per cwt.		Per lb.	Per cwt.	
d.	s.	d.	d.	s.	d.	d.	s.	d.
¼	2	4	4¼	39	8	8¼	77	0
½	4	8	4½	42	0	8½	79	4
¾	7	0	4¾	44	4	8¾	81	8
1	9	4	5	46	8	9	84	0
1¼	11	8	5¼	49	0	9¼	86	4
1½	14	0	5½	51	4	9½	88	8
1¾	16	4	5¾	53	8	9¾	91	0
2	18	8	6	56	0	10	93	4
2¼	21	0	6¼	58	4	10¼	95	8
2½	23	4	6½	60	8	10½	98	0
2¾	25	8	6¾	63	0	10¾	100	0
3	28	0	7	65	4	11	102	8
3¼	30	4	7¼	67	8	11¼	105	0
3½	32	8	7½	70	0	11½	107	4
3¾	35	0	7¾	72	4	11¾	109	8
4	37	4	8	74	8	12	112	0

PHARMACY AND POISON LAWS OF GREAT BRITAIN AND IRELAND.

GREAT BRITAIN.

The Arsenic Act, 1851, recites conditions for the sale of white arsenic.

The Pharmacy Act, 1852, gave the Pharmaceutical Society of Great Britain power to hold examinations and grant title of pharmaceutical chemist.

The Pharmacy Act, 1868, comprises regulations for the sale of poisons and registration of retailers and dispensers of same.

The Pharmacy Act, 1869, amends provisions of 1868 Act in the case of medical practitioners and veterinary surgeons.

The Pharmacy Act, 1898, enables chemists and druggists to become members of the Pharmaceutical Society.

SCHEDULE OF POISONS.
PART 1.

The poisons named in this part may not be sold by retail unless:

(1) The purchaser be known to the seller, or be introduced by a person known to the seller also.

(2) Each sale be entered in the poison book as follows: (*a*) date of sale; (*b*) name and address of purchaser; (*c*) name and quantity of poison sold;

IRELAND.

The Arsenic Act, 1851.

Sale of Poisons Act (Ireland), 1870, relates to the sale of poisons and adulteration.

Pharmacy Act (Ireland), 1875, creates the Pharmaceutical Society of Ireland, and provides for registration of dispensers and retailers of poisons.

Pharmacy Act (Ireland), 1875, Amendment Act, 1890, creates registered druggists.

Statute-Law Revision (No. 2) Act, 1893, repeals a few minor enactments of the Acts 1870 and 1875.

SCHEDULE OF POISONS.
PART 1.

Same as in Great Britain.

GREAT BRITAIN.	IRELAND.
SCHEDULE OF POISONS (*continued*).	
(*d*) purpose for which it is stated to be required; (*e*) signature of the purchaser, and introducer, if any (Arsenic, *vide* p. 507).	
(3) The poison sold must be labelled with (*f*) the name of the article; (*g*) the word "Poison"; (*h*) the name and address of the seller.	
Aconite and its preparations. Arsenic and its preparations. Atropine and its preparations. Cantharides. Corrosive sublimate. Cyanide of potassium and all metallic cyanides. Emetic tartar. Ergot of rye and its preparations. Prussic acid. Savin and its oil. Strychnine. All poisonous vegetable alkaloids and their salts.	Same as in Great Britain.
PART 2.	PART 2.
The poisons named in this part may not be sold by retail unless labelled with (*a*) the name of the article; (*b*) the word "poison"; (*c*) the name and address of the seller.	Same as in Great Britain.
Ammoniated mercury (commonly known as white precipitate of mercury). Belladonna and its preparations. Cantharides, tincture and all vesicating liquid preparations of. Liquid preparations of carbolic acid and its homologues containing more than 3 per cent. of those substances, except any preparation used as a sheepwash or for any other purpose in connection with agriculture or horticulture. Chloral hydrate and its preparations. Chloroform. Corrosive sublimate, preparations of. Essential oil of almonds, unless deprived of its prussic acid. Morphine, preparations of. Nux vomica and its preparations. Opium and all preparations of opium or of poppies. Oxalic acid. Phenol and its homologues (liquid preparations containing more than 3 per cent.). Red oxide of mercury (commonly known as red precipitate of mercury). Vermin-killers, *i.e.*, "every compound containing any poison within the meaning of the Pharmacy Act, 1868, when prepared or sold for the destruction of vermin."	Same as in Great Britain, with the following additions. Sulphuric ether. Phosphorus, and all preparations containing it in a free state. Preparations of strychnine. Biniodide of mercury.

POSTAL REGULATIONS.

PRINCIPAL POST-OFFICE CHARGES.

Letter Post.

Inland.—Not exceeding 4 oz. . . . . 1*d.*
For every additional 2 oz. . . . . ½*d.*
Postcard . . . . . ½*d.*

Colonial and Foreign.—To undermentioned British Possessions and Protectorates, viz.: Aden, Ascension, Bahamas, Barbados, Bermudas, British Central Africa, British East Africa, British Guiana, British Honduras, British North Borneo, Canada, Cape Colony, Ceylon, Cyprus, Falkland Islands, Fiji, Gambia, Gibraltar, Gold Coast, Hong Kong, India, Jamaica, Johore, Labuan, Lagos, Leeward Islands (viz., Antigua, St. Kitts, Nevis, Dominica, Montserrat, and the Virgin Islands), Malay States (Protected, viz., Perak, Selangor, Negri-Sembilan, and Pahang), Malta, Mauritius, Natal, Newfoundland, Niger Coast Protectorate, Niger Territory, St. Helena, Sarawak, Seychelles, Sierra Leone, Straits Settlements, Tobago, Trinidad, Turk's Islands, Windward Islands (viz., Grenada, St. Lucia, St. Vincent, and the Grenadines), and Zanzibar.

Per ½ oz. . . . . 1*d.*
Elsewhere per ½ oz. . . . . 2½*d.*
Postcard . . . . . 1*d.*

Book Post.

Inland.—Not exceeding 2 oz. . . . . ½*d.*
For every additional 2 oz. . . . . ½*d.*
Colonial and Foreign.—Per 2 oz. . . . . ½*d.*

Parcel Post.

Inland.—Not exceeding 1 lb. . . . . 3*d.*
And 1*d.* for each additional 1 lb. up to 11 lbs. which is the maximum.

Newspaper Post.

Inland.—Each registered newspaper . . . . ½*d.*
Colonial and Foreign as book post.

Telegrams.

Inland.—For first twelve words . . . . . 6*d.*
For each additional word . . . . . ½*d.*

Postal Orders.

The orders are issued for fourteen amounts, upon which poundage is charged as follows:—

Amount.	*Poundage.*
1*s.*	½*d.*
1*s.* 6*d.*	½*d.*
2*s.*, 2*s.* 6*d.*, 3*s.*, 3*s.* 6*d.*, 4*s.*, 4*s.* 6*d.*, 5*s.*, 7*s.* 6*d.*, 10*s.*, 10*s.* 6*d.*,	each, 1*d.*
15*s.*, and 20*s.*,	,, 1½*d.*

Inland Money Orders.

For sums not exceeding £1	2*d.*
,, exceeding £1 and not exceeding £3	3*d.*
,, ,, £3 ,, ,, £10	4*d.*

Money Orders for Places Abroad.

For sums not exceeding £2	6*d.*
,, exceeding £2 and not exceeding £6	1*s.*
,, ,, £6 ,, ,, £10	1*s.* 6*d.*

Registration.

Letters, parcels, and postal packets are registered at 2*d.* to 1*s.* 2*d.* each, the compensation ranging from £5 to £120. Coins, watches, or jewellery must be registered. The letters or packets must be marked "Registered," and handed over the counter at a post office. The special post office envelopes should be used when possible.

Newspapers and Books.

The postal rate on newspapers is ½*d.* each. A packet must not exceed 5 lbs. in weight or 2 feet in length or 1 foot in width or depth. Newspaper wrappers bearing ½*d.* or 1*d.* stamps are obtainable at 4*d.* for seven or 8½*d.* for eight.

Books, if sent by book-post, must be posted either without wrapper, or in an unsealed envelope or cover so as to be easy of inspection. Size of the packet allowed is the same as for newspapers.

Commercial papers such as invoices, orders for goods, advice notes, way-bills, bills of lading, receipts, statements of account, prices current, market reports, etc., are accepted for transmission at the book packet rate, conditionally upon nothing appearing in writing on the documents save dates, the names and addresses of the parties, the particulars and prices of any goods, or the particulars of any sums of money to which the document relates, and the mode of consignment of any such goods or money. Matter in the nature of a letter must be wholly in print, and must relate exclusively to the subject-matter of the document.

Circulars are also received at the book rate.

Parcels.

Limitations.—The size for an inland parcel is—

Greatest length, 3½ feet; greatest length and girth combined, 6 feet.

The maximum weight allowed for an inland parcel is 11 lbs.

Parcels to or from the Channel Islands or the Isle of Man and the

United Kingdom are liable to Customs duty on delivery if they contain anything dutiable.

Compensation up to £2 is allowed for parcels lost or damaged though not registered, under certain conditions, *but not for fragile or perishable articles.*

Colonial and Foreign Service.

Book Post.—The articles permitted to be sent at the book post rate are printed, and commercial papers similar in nature to those already described. The lowest charge for books is ½*d.*, and for commercial papers, 2½*d.*, and up to 10 oz. may be sent for the latter sum. Packets addressed to British Colonies or Possessions and non-Union countries must not exceed 2 feet long and 1 foot wide or deep, and 5 lbs. in weight. To Foreign Countries in the Postal Union the length is limited to 18 inches, and the weight to 4 lbs. A roll may be 30 inches long and 4 inches in diameter. The packets must be open for inspection.

Patterns and Samples.—Rate, 1*d.* the first 4 oz., ½*d.* for every additional 2 oz. The samples must be *bonâ fide* trade patterns or samples of merchandise, so packed as to give freedom of inspection. The limit of weight for British Colonies or Possessions or for non-Union countries is 5 lbs., and of dimensions 2 feet by 1 foot by 1 foot.

Parcels conveyed to colonial and foreign parts through the Post Office are subject to the Customs regulations of the country to which they are addressed. Declarations have to be made by the sender *on forms obtainable from the Post Office.* Generally an invoice may be enclosed in the parcel but not a letter.

Profit Assessment.

The following examples show how the questions of profits and percentages upon cost and sales can be calculated. The cost and profit figures may be taken as either pounds, shillings, pence, or farthings.

1. To find the percentage of profit on cost—

Say the cost is 8 and the profit 4.

$$4 \times 100 = 400 \div 8 = 50 \text{ per cent.}$$

2. To find the percentage of profit on sales—

Taking the same figures for cost and profit.

$$4 \times 100 = 400 \div 12\ (4+8) = 33 \text{ per cent.}$$

3. To find what amount to add to cost to realize a certain rate per cent. upon the cost—

Say the cost is 6 and the rate required 25 per cent.

$$6 \times 25 = 150 \div 100 = 1{\cdot}5\,;$$

which may be £1 10*s.*, 1*s.* 6*d.*, or 1½*d.*

4. To find what amount to add to cost to produce a certain rate per cent. upon sales—

Say the cost is 6 and the rate 25.

$$6 \times 25 = 150 \div 75\ (100-25) = 2.$$

A Handy Table for Assessing Profits.

By adding to the cost, as follows, the relative percentages of profit are obtained:—

One half	50	per cent.	on cost, and	33	per cent.	on sales.
„ third	33·33	„	„	25	„	„
„ fourth	25	„	„	20	„	„
„ fifth	20	„	„	16·6	„	„
„ sixth	16·6	„	„	14·28	„	„
„ seventh	14·28	„	„	12·5	„	„
„ eighth	12·5	„	„	11·11	„	„
„ ninth	11·11	„	„	10	„	„
„ tenth	10	„	„	9·09	„	„
„ eleventh	9·09	„	„	8·33	„	„
„ twelfth	8·33	„	„	7·69	„	„
„ thirteenth	7·69	„	„	7·14	„	„
„ fourteenth	7·14	„	„	6·66	„	„
„ fifteenth	6·66	„	„	6·25	„	„
„ sixteenth	6·25	„	„	5·88	„	„
„ seventeenth	5·88	„	„	5·55	„	„
„ eighteenth	5·55	„	„	5·26	„	„
„ nineteenth	5·26	„	„	5	„	„
„ twentieth	5	„	„	4·76	„	„

Relation of the Imperial to the Metric Standards.

Standards of Mass.

1 Pound=453·59243 grammes.
1 Ounce=28·34953 grammes, or 28·35 grm. nearly.
1 Grain=0·064798918 gramme, or 0·0648 grm. „

Standards of Capacity.

1 Gallon=4·5459631 litres.
1 Pint=0·5682454 litre, or 568·336 cubic centimetres nearly.
1 Fluid Ounce=0·0284123 litre, or 28·417 cubic centimetres nearly.
1 Fluid Drachm=0·003552 litre, or 3·552 cubic centimetres „
1 Minim=0·000059 litre, or 0·059 cubic centimetre nearly.

Standards of Length.

1 Yard=0·914399 metre.
1 Foot=0·30480 metre=30·48 centimetres.
1 Inch=0·02540 metre=25·40 millimetres.

SOLUBILITIES OF CHEMICALS, ETC., B.P. 1898.

	Cold Water.	Boiling Water.	Alcohol, 90%.	Ether.	Chloroform.	Glycerine.
Acetanilid	1 in 200	1 in 18	1 in 4	freely soluble	freely soluble	
Acid Arsenios	1 in 100	1 in 10				1 in 5
„ Benzoic	1 in 400	1 in 17	1 in 3	1 in 2½	1 in 7	
„ Boric	1 in 30 (?)	1 in 3	1 in 30			1 in 4
„ Carbolic	1 in 12		freely soluble	freely soluble	freely soluble	freely soluble
„ Citric	1 in ¾	1 in ½	slightly less soluble	slightly soluble		
„ Gallic	1 in 100	1 in 3	1 in 5	1 in 40		1 in 12 (?)
„ Salicylic	1 in 500	1 in 15	1 in 3	1 in 2		1 in 200
„ Tannic	1 in 1		1 in 1			1 in 1
„ Tartaric	less than 1 in 1		less than 1 in 3			
Alum	1 in 10	1 in ⅓	insoluble			freely soluble
Ammon. Benz.	1 in 6		1 in 30			1 in 8
„ Carb.	1 in 4					
„ Chloride	1 in 3		1 in 60			
„ Phosph.	1 in 4		insoluble			
Antimonium Tartaratum	1 in 17	1 in 3	almost insoluble			
Apomorph. Hydrochlor.	1 in 50		more soluble			
Argent Nitras	less than 1 in 1		slightly soluble	soluble		soluble
Atropine	1 in 300		readily soluble	readily soluble	readily soluble	
„ Sulph.	1 in 1		1 in 10	insoluble	insoluble	
Borax	1 in 25	1 in ½	insoluble			1 in 1
Butyl Chloral Hydrate	1 in 50		1 in 1		1 in 20	1 in 1
Caffeina	1 in 80	easily soluble	easily soluble	sparingly soluble	easily soluble	
„ Citras	1 in 32					
Calcii Chlorid.	1 in 1		1 in 3			
„ Hypophos.	1 in 8		insoluble			
Camphor	1 in 700		about 1 in 1	very soluble	1 in ¼	
Chloral Hydrate	less than 1 in 1		less than 1 in 1	less than 1 in 1	1 in 4	
Cocaina	almost insoluble		1 in 10	1 in 4	1 in ½	insoluble

SOLUBILITY OF CHEMICALS, ETC. (*continued*).

	Cold Water.	Boiling Water.	Alcohol, 90%.	Ether.	Chloroform.	Glycerine.
Cocainæ Hydrochlor.	1 in ½		1 in 4	almost insoluble		1 in 4
Codeina	1 in 80		readily soluble	1 in 30	readily soluble	
„ Phosphate	1 in 4		much less soluble			
Creosote	1 in 400		freely soluble	freely soluble		
Cupri Sulph.	1 in 3½		almost insoluble			very soluble
Ferri et Ammon. Cit.	1 in ½		almost insoluble			
Ferri et Quin. Citras	1 in ½					
Ferri Sulphas	less than 1 in 2		insoluble			
Glusidum	1 in 400	1 in 24	1 in 25	slightly soluble	slightly soluble	
Homatropinæ Hydrobrom.	1 in 6		1 in 133 (absolute)			
Hyd. Perchlor.	1 in 16	1 in 2	1 in 3	1 in 4		1 in 2
Hyoscinæ Hydrobrom.	1 in 1		1 in 13	very slightly soluble	very slightly soluble	
Hyoscyaminæ Sulph.	1 in ½		1 in 2½	very slightly soluble	very slightly soluble	
Iodoform	very slightly soluble		1 in 80 cold 1 in 10 boiling	1 in 5	soluble	
Iodine	1 in 5000		freely soluble	freely soluble	freely soluble	
Lithii Carb.	1 in 70		insoluble			
„ Cit.	1 in 2					
Mag. Sulph.	1 in 1					
Morphinæ Acet.	1 in 2½		1 in about 100			
„ Hydrochlor.	1 in 24	1 in 1	1 in 50			
„ Tartras	1 in 11		almost insoluble			
Naphthol	1 in 1000	1 in 75	less than 1 in 2	very soluble	very soluble	
Paraldehyd.	1 in 10	less soluble	all proportions	all proportions		
Pepsin	moderately soluble		1 in 100			
Phenacetin	very sparingly soluble	more freely	1 in 20			
Phenazone	1 in 1		1 in 1⅓	1 in 40	1 in 1⅓	
Phosphorus	insoluble		1 in 350 (absolute)	1 in 80	1 in 25	

SOLUBILITY OF CHEMICALS, ETC. (*continued*).

	Cold Water.	Boiling Water.	Alcohol, 90%.	Ether.	Chloroform.	Glycerine.
Picrotoxin	1 in 330	1 in 35	1 in 13, cold 1 in 3, boiling			
Pilocarpin Nit.	1 in 8 or 9		slightly soluble, cold freely soluble, boiling			
Plumbi Acet.	less than 1 in 3		1 in 30			
„ Iodid.	1 in 2000	1 in 200				
Pot. Caustic	1 in ½		1 in 2			
„ Acet.	1 in ½		1 in 2			
„ Bicarb.	1 in 4		almost insoluble			
„ Bichrom.	1 in 10					
„ Bromide	1 in 2		1 in 200			
„ Carb.	1 in 1		insoluble			
„ Chlor.	1 in 16	1 in 3				
„ Citras	very soluble					
„ Iodid.	less than 1 in 1		1 in 12			
„ Nitras	1 in 4	1 in ½				
„ Permang.	1 in 20					
„ Sulph.	1 in 10	1 in 4	insoluble			
„ Tart.	1 in 1					
„ „ Acid	1 in 200		insoluble			
Quin. Hydrochlor.	1 in 35	very soluble	1 in 3, cold very soluble, boiling			
„ „ Acid	less than 1 in 1					
„ Sulphas.	1 in 800					
Sacch. Lact.	1 in 7	1 in 1				
„ Purificat.	1 in ½					
Salicine	1 in 28		1 in 60	insoluble		

SOLUBILITY OF CHEMICALS, ETC. (*continued*).

	Cold Water.	Boiling Water.	Alcohol, 90%.	Ether.	Chloroform.	Glycerine.
Salol	almost insoluble		1 in 10, very soluble, boiling	1 in $\frac{1}{3}$	1 in $\frac{1}{3}$	
Santonin	scarcely soluble	sparingly soluble	1 in 40, cold 1 in 3, boiling		1 in 4	
Sapo Durus	1 in 20	1 in $1\frac{1}{2}$	soluble			
Sodii Arsen.	1 in 6		slightly soluble			
„ Benz.	1 in 2		1 in 24, cold 1 in 12, boiling			
„ Bicarb.	1 in 11					
„ Bromid.	less than 1 in 2		1 in 16			
„ Carb.	1 in 2					
„ Chlorid.	less than 1 in 3					
„ Hypophos.	1 in 1		1 in 30	insoluble		
„ Iodid.	less than 1 in 1		1 in 3			
„ Phosphas	1 in 6					
„ Salicylas	less than 1 in 1		1 in 6			
„ Sulphas	1 in less than $\frac{1}{2}$ (77° to 86° F.)		insoluble			
„ Sulphocarb.	1 in 6		1 in 150			
Strychnine	very sparingly soluble		1 in 150, cold	nearly insoluble	1 in 6	
„ Hydrochlor.	1 in 35		1 in 60			
Sulphonal	1 in 450	1 in 15	1 in 50, cold very soluble, boiling	soluble		
Sulphur Iodid.	insoluble					1 in 60
Veratrine	insoluble		1 in 3	1 in 6	1 in 3	
Zinci Acet.	1 in $2\frac{1}{2}$					
„ Sulphas	less than 1 in 1					
„ Sulphocarb.	1 in 2		1 in $2\frac{1}{2}$			

Transformation of Columns of Water into Columns of Mercury.

Millim. of Water.	Millim. of Mercury.	Millim. of Water.	Millim. of Mercury.
1	·074	35	2·58
2	·15	40	2·95
3	·22	45	3·32
4	·30	50	3·69
5	·37	55	4·06
6	·44	60	4·43
7	·52	65	4·80
8	·59	70	5·17
9	·66	75	5·54
10	·74	80	5·90
15	1·12	85	6·27
20	1·48	90	6·64
25	1·84		
30	2·21		

Various Useful Data.

To reduce specific gravity with regard to air, to specific gravity with regard to hydrogen, multiply by 14·438.

To reduce specific gravity with regard to hydrogen, to specific gravity compared to air, multiply by ·06926.

To reduce weight in air to weight in vacuo:

P=weight required in vacuo.
q=weight in air.
V=volume of body weighed.
v=volume of the weights.
s=specific gravity of air (weight of one cubic unit).

$$P = q \times s\,(V - v).$$

To find the circumference of a circle:

a=circumference. r=diameter.
n=3·1415926. a=n r.

To find contents of a sphere=c:

$c = d^3 \times \cdot 5236$. d=diameter.

To find contents of a cylinder=c:

c=area of base, × height.

To find the contents of a rectangular vessel=c:

a=length. h=height.
b=breadth. $c = a \times b \times h$.

To convert the degrees of Twaddle's hydrometer into specific gravity multiply by 5, and add 1000; this gives the specific gravity with reference to water as 1000.

To convert lbs. per square inch into kilograms per square centimetre multiply by ·0703.

To convert kilograms per square centimetre into lbs. per square inch multiply by 14·2247.

To reduce inches to metres, multiply by ·02540.

To reduce inches to centimetres, multiply by 2·540.

To reduce centimetres to inches, multiply by ·3937.
To reduce kilograms to pounds, multiply by 2·2046.
To reduce litres to gallons, multiply by ·22.
To reduce gallons to litres, multiply by 4·548.
To reduce pints to cubic centimetres, multiply by 567·936.
To reduce grams to grains, multiply by 15·432.
To reduce grains to grams, multiply by ·0648.
To reduce ounces to grams, multiply by 28·349.

The following data are useful in calculations relating to air:

To find the quantity of nitrogen by volume corresponding to 1 volume of oxygen, multiply by 3·770992.

To find the quantity of oxygen by volume corresponding to 1 volume of nitrogen, multiply by ·265182.

To find the quantity of nitrogen by weight corresponding to 1 part by weight of oxygen, multiply by 3·313022.

To find the quantity of oxygen by weight corresponding to 1 part by weight of nitrogen, multiply by ·301839.

To find the quantity of nitrogen by volume corresponding to 1 part by weight of oxygen, multiply by 2·6365411.

To find the quantity of oxygen by volume corresponding to 1 part by weight of nitrogen, multiply by ·2730071.

To find the quantity of nitrogen by weight corresponding to 1 part by volume of oxygen, multiply by 3·6629154.

To find the quantity of oxygen by weight corresponding to 1 part by volume of nitrogen, multiply by ·3792848.

Weights and Measures of Imperial System.

Measures of Mass.

1 grain	gr.	
1 ounce (avoir.)	oz.	=437·5 grains.
1 pound	lb.=16 ounces= 7000	„

Measures of Capacity.

1 minim	min.	
1 fluid drachm	fl. drm.=60 minims.	
1 fluid ounce	fl. oz.	= 8 fluid drachms.
1 pint	O	=20 fluid ounces.
1 gallon	C	= 8 pints.

Measures of Length.

1 inch	in.	
1 foot	ft.	=12 inches.
1 yard	yd.	=36 „

Relation of Volume to Mass.

1 minim	is the volume at 62° F. of		0·9114583 grain of water.		
1 fluid drachm	„	„	54·6875 grains		„
1 fluid ounce	„	1 ounce or	437·5	„	„
1 pint	„	1·25 pounds or	8750·0	„	„
1 gallon	„	10 pounds or	70000·0	„	„
109·7143 minims [1]=the volume at 62° F. of				100 „	„

[1] Taken as 110 minims throughout the Pharmacopœia.

Weights and Measures of Metric System.

Measures of Mass.

1 milligramme=the thousandth part of one grm. or 0·001 grm.
1 centigramme=the hundredth part of one grm. or 0·01 grm.
1 decigramme =the tenth part of one grm. or 0·1 grm.
1 gramme =weight of one millilitre of distilled water at 4° C. (39·2° F.) or 1·0 grm.
1 dekagramme=ten grammes or 10·0 grm.
1 hectogramme=one hundred grammes or 100·0 grm.
1 kilogramme =one thousand grammes or 1000·0 grm.

Measures of Capacity.

1 millilitre=the volume at 4° C. of 1 grm. of water.
1 centilitre= ,, ,, of 10 ,,
1 decilitre = ,, ,, of 100 ,,
1 litre = ,, ,, of 1000 grm. (1 kilog.).

Measures of Length.

1 millimetre=one thousandth part of one metre or 0·001 metre.
1 centimetre=one hundredth ,, ,, or 0·01 ,,
1 decimetre =one tenth ,, ,, or 0·1 ,,
1 metre 1·0 ,,

Relation of Cubic Measures to Measures of Capacity.

1 cubic centimetre=0·99984 millilitre.
1 cubic decimetre =0·99984 litre, or 1000 cub. centim.

1·00016 cubic centimetres=1 millilitre.
1·00016 cubic decimetres =1 litre, or 1000 millilitres.

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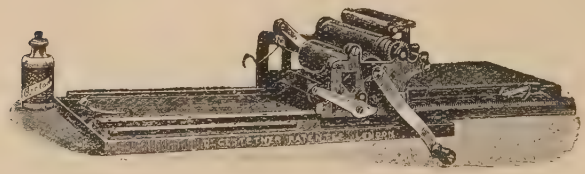

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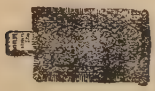

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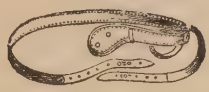

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